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ABSTRACT

A study of 41 toddlers (ages 18-25 months) with hearing impairments and their hearing mothers and 54 typical toddlers and their hearing mothers, investigated whether the development of a normal mother-child relationship is disrupted by the inability of the child to understand his/her mother's normal means of communication. The study also explored what aspects of the mother-child relationship related to subsequent language and socio-emotional development. A majority of the dyads were reassessed when the children were 3 years old and again assessed when the children were 4 years old. Findings indicate: (1) toddlers with hearing impairments and their mothers miscommunicated much more frequently; (2) toddlers with hearing impairments frequently did not respond to their mothers' communication because they did not seem to hear or see it; (3) toddlers with hearing impairments and their mothers spent less time interacting; (4) toddlers with hearing impairments used more visual and little verbal communication and were more likely to start a new topic rather than continue one; and (5) despite their communicative difficulties and their delayed language development, toddlers with hearing impairments were as likely to establish a positive, reciprocal, secure relationship with their mothers as were typical toddlers. Appendix A contains the coding manuals for the project, including "Microanalysis of Communication between Mother and Child" (Amy R. Lederberg and others); "Interaction Coding Manual: Mother-Child Interaction" (Amy R. Lederberg); and "Quality of Mother-Child Interaction" (Amy R. Lederberg and others); and a reprint of an article, "The Effect of Hearing Impairment on the Quality of Attachment and Mother-Toddler Interaction," by Amy R. Lederberg and Caryl E. Mobley. (Contains 43 references.) (CR)

Antecedents of Language Competence and Social-Emotional Adjustment of Young Deaf Children

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Final Report
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Antecedents of Language Competence and Social-Emotional Adjustment of Young Deaf Children

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Over 90% of hearing impaired children are born to hearing parents who have little or no previous contact with hearing impairment. In these families, both educators and researchers have hypothesized that the development of a normal mother-child relationship is disrupted by the inability of the child to understand his/her mother's normal means of communication (Harris, 1978; Moores, 1982; Schlesinger & Meadow, 1972; Wedell-Monnig & Lumley, 1980). The primary purpose of this project was to test this hypothesis. The study was also designed to explore what aspects of the mother-child relationship relate to subsequent language and socio-emotional development.

METHODOLOGICAL OVERVIEW

Subjects.

Hearing impaired children and their hearing mothers (hearing impaired dyads). This study included 41 hearing impaired toddlers who were between 18 and 25 months of age (M age = 22 months) and their hearing mothers. All hearing impaired children and their mothers were enrolled in one of six public school parent education programs for hearing impaired children in a major metropolitan area. This represented all the urban and suburban schools in the area. Once an infant or toddler was identified as hearing impaired, s/he was referred to the public schools and enrolled in one of these six programs. Because these programs were free and consisted entirely of home visits, the participation rate was high. Parent advisors referred to us all hearing impaired children under the age of 24 months who were not multiply handicapped and whose parents were hearing. Only three mothers referred to us refused to participate. Nine toddlers, on the average, were referred during a year, with data collected over a five year period.

The subjects included 20 boys and 21 girls; 33 white, 7 black, and 1 Hispanic children; 37 intact families, 3 single mothers, and 1 divorced mother; 19 mothers were employed full-time, 20 were not employed and 2 worked part-time; 1 mother had a grade school education, 1 had some high school education, 10 had graduated high school, 26 had attended college, and 3 had attended graduate school. The sample clearly included a broad range of families.

On the average, the children were identified as hearing impaired at 10 months (range = 1-21 months) and had been enrolled in an intervention program for 8 months (range = 0-22 months) at the time of the study. Thirty had a severe to profound hearing loss, 7 had a moderate to severe loss and 4 had a mild to moderate loss. Causes of hearing impairment included genes (n = 3), meningitis (n=12), pneumonia (n=2), atresia and birth complications (n=1 each), and unknown (n = 22). At the time of data collection, 8 mothers were using some sign language; 11 had some training in using an oral approach; 22 mothers used only speech with their children, but had not yet decided on the type of linguistic approach they wanted to use. During the 15 min free play, the modal number of verbal utterances (either speech or sign) the children used was 0 (range = 0-69).

Out of the original 41 children, 34 hearing impaired dyads were reassessed when the children were 3 years old. Thirty dyads were again assessed when the children were 4 years old.

Hearing children and their hearing mothers (hearing dyads). This study included 54 hearing toddlers who were between 18 and 25 months of age (M age = 22 months) and their hearing mothers. This group were recruited so as to be able to form a sample of hearing dyads that matched the hearing impaired dyads for ethnicity, sex of child, maternal and paternal occupation and education, marital status, and maternal work status. Forty four of the original 54 hearing dyads were reassessed when the children were 3 years old. Thirty-four dyads were reassessed when the children were 4 years old.

Setting

All mother-child observations took place in a small playroom at the Callier Center for Communication Disorders equipped with two one-way mirrors on opposite walls. Two color videocameras were operated from behind the opposite walls of one-way glass, and their pictures were combined using a special effects generator. The operator of the special effects generator communicated with the two camera operators via headphones to insure that the face and hands of both child and mother were recorded at all times. Time to the nearest second was superimposed on the bottom of the split screen image. Sound was recorded via a microphone suspended from the playroom ceiling.

Procedures

Procedures: Data Collection Overview

Toddlers. At approximately 22 months of age, 41 hearing impaired and 54 hearing toddlers were scheduled for two visits approximately one week apart. During the first visit, mother-toddler interaction in free play and problem-solving situations was videotaped. The order of these two situations was counterbalanced. During the second visit, the toddlers experienced Ainsworth's Strange Situation with their mothers. To obtain background information, mothers was interviewed twice: at the start of the first visit and following the attachment assessment. The Denver Developmental Screening Test was administered following the second interview. Audiological information was obtained from the deaf children's school files.

Preschoolers. At 36 and 48 months of age, each mother-child dyad was asked to return to Callier Center. At the start of the visit, the mother was interviewed concerning changes in maternal employment, family status, child care arrangements and sign language experience. Then, mother-child interaction was videotaped during 20 minutes of free play and 10 minutes of problem-solving.

The Leiter International Performance Scale was administered to the deaf and hearing children at 3 and 4 years of age by a research assistant.

At both 36 and 48 months, audiological information of the deaf children was obtained from school files.

In addition, the children's language development and social-emotional adjustment was assessed at 3 and 4 years of age. The language assessments included a spontaneous language sample and a vocabulary test. The socio-emotional assessment was completed by the children's teachers and included a questionnaire and a Q-sort procedure.

Procedures: Mother-Child Relationship

Mother-child interaction. For the free play situation, mother and child were led into a small laboratory playroom equipped with age-appropriate toys, pillows, and drawings on the wall. All interactions in this room were videotaped through two one- way mirrors. Mothers were instructed to pretend they were at home and have a few minutes of free play with their child.

For the problem-solving task, mother and child were observed in a problem-solving task similar to the one used by Easterbrooks and Goldberg (1984) with nonhandicapped 20-month-olds. The purpose of this task is to observe the way the child approaches a difficult task and how he or she seeks and responds to parental assistance. The instructions are left purposely vague to allow the expression of individual differences in parental sensitivity. Two toys, one selected to be too difficult to be solved by the child alone, were placed in front of the child. Shape sorters were used for the toddlers, puzzles were used for the preschoolers. Mothers were given the following instructions: "Here are two shape sorters (puzzles) for _____ to play with. We expect that many of the shapes will be too difficult for _____ but we're not testing how much _____ can do. We're just interested in how he/she plays with this kind of toy. You should feel free to give _____ whatever help you think he/she needs."

Attachment. Mother-toddler attachment was assessed using the standardized procedure known as the Strange Situation (Ainsworth et al., 1978). Mother and toddler were led into the Callier Center playroom which contained age-appropriate toys (different from the ones used previously during free play) and two chairs (one for mother, one for stranger). The researcher briefly reviewed the procedure and then left mother and child alone in the room. The standardized 21 minute procedure is as follows:

Episode 1: The mother sits in her chair while the toddler is free to explore the room and/or approach the mother.

Episode 2: The female stranger enters the room and sits quietly in her chair for the first minute, begins a friendly conversation with the mother the second minute, and gently approaches the toddler the last minute.

Episode 3: When signaled the mother leaves the room while toddler and stranger remain.

Episodes 4: The mother returns, entering the room and attracts the toddler's attention. The mother pauses briefly inside the door to allow the toddler to take initiative in seeking or avoiding interaction.

Episode 5: When signaled, the mother leaves the room. The toddler is left alone.

Episode 6 : The stranger returns and tries to comfort the toddler if necessary.

Episode 7: The mother returns following the same procedure as the first reunion. (The stranger leaves unobtrusively.)

Procedures; Language Assessment

Language sample. Two language samples was used. The first was the spontaneous language used by the children during the 20 minutes of mother- child interaction. Second, since the maternal language abilities may be restricting the level of language used by the children during mother-child interaction, an independent spontaneous language sample was obtained during school hours when the

children were 3 and 4 years of age. For this sample, an experienced-signing research assistant who was familiar to the children was videotaped interacting with each child for 15 minutes in the playroom. Following this free play session, a more structured storytelling task was conducted. The child was shown novel, simple picture books. For each picture in the book, the child was first encouraged to spontaneously describe the picture, then the research assistant described the picture and the child was encouraged to label the picture. All language samples were videotaped.

The Total Communication Receptive Vocabulary Test. At 3 and 4 years of age, the Total Communication Vocabulary Test was administered to the deaf children by a research assistant at the children's school. This test was designed specifically to assess the receptive vocabulary of hearing impaired children taught by Total Communication. The test is similar in format to the Peabody Vocabulary Test and contains a series of 75 plates, each of which contains four pictures. The plates are presented one at a time to the child who must point to the picture which best depicts the word signed and said by the examiner.

Procedures: Social-Emotional Assessment

At 3 and 4 years of age, children's social-emotional development was assessed by having the children's teachers complete the Meadow/Kendall Inventory and the Child Q-sort. Because these procedures need to be conducted in a school setting, all deaf children but (only) those hearing children enrolled in a preschool or day care were assessed along this dimension.

Meadow/Kendall Socio-Emotional Assessment Inventory for Deaf Preschoolers. This 49-item rating inventory is designed to assess social-emotional adjustment of deaf children from 3-6 years of age . The rater is instructed to rate how accurately an item describes the behavior of the child on a 4 point scale (from very true to very false) using all (deaf and hearing) children as a reference group. Factor analysis of past inventories indicated the items fell on four scales: a) Sociable, Communicative Behavior, which measures sociable, friendly, and communicative behaviors (e.g., Forms warm, close attachment to (friendships with) peers.); b) Impulsive, Dominating Behaviors, which measures aggressive, impulsive, and destructive behavior (e.g., Accepts delay of gratification. Does not expect instant satisfaction of every need, whim, or desire.); c) Developmental Lags, which measures achievement of developmental or maturational abilities (e.g., Wets pants).; d) Anxious, Compulsive Behaviors, which measures the child's level of anxiety or obsessional behavior, (e.g., Shows great concern or preoccupation with insignificant details).

California Child Q-Sort (CCQ): Overview. The CCQ (Block & Block, 1980) contains 100 items which describe a variety of social and personality characteristics of children (e.g., is friendly). Using a Q-sort methodology, the Q-set can be used to describe the social and personality attributes of either an individual subject or an ideal child (such as the most social-competent, ego resilient, or undercontrolled child). In either case, items are sorted into 9 piles (categories) which range from most characteristic to least characteristic of a particular subject. The number of items per pile in the final distribution is required to conform to a standard quasi-normal distribution: 5, 8, 12, 16, 18, 16, 12, 8, 5. The placement of an item in this distribution (piles 1-9) determines its score. Thus, the score given to an item reflects the salience for that item (relative to other items) as a description of the social and

personality characteristics of a particular child. This description of an individual subject can then be correlated with criterion Q-sorts (e.g., a Q-sort definition of a hypothetically most ego-resilient child) to obtain a measure (a Pearson correlation coefficient) for that subject along that dimension. A high correlation between CCQ description of a child by a rater and a criterion Q-sort for ego-resiliency would indicate the child is ego-resilient; a low correlation would indicate the child is ego-brittle. Criterion Q-sorts are obtained by asking experts (e.g., psychologists, teachers) to describe a hypothetical child who is the most _____ (ego- resilient, undercontrolled or socially competent) by sorting the Q-set into the standard distribution. Block and Block (1979) have provided criterion CCQ definitions for ego-resiliency and ego-undercontrol by having three psychologists sort the Q-set to describe the hypothetically most ego-resilient preschool child and, separately, the most ego-undercontrolling preschool child.

The data collected from this project has resulted in several reports that are summarized below.

THE EFFECT OF DEAFNESS ON THE MOTHER-CHILD RELATIONSHIP

Mother-Toddler Relationship (Lederberg & Mobley, 1990)

Past research suggests deafness affects the quality of the mother-preschooler relationship. Hearing mothers of deaf 3- to 5-year-olds have been rated as more controlling, intrusive, didactic, rigid, disapproving, and negative with their children than mothers of hearing children. Deaf preschoolers have been rated as less responsive, creative, happy, and positive with their mothers than were hearing preschoolers (Schlesinger & Meadow, 1972). Other researchers have also found mothers of hearing impaired preschoolers less positive (Goss, 1970), more controlling or directive (Brinich, 1980; Henggeler & Cooper, 1983; Henggeler, Watson, & Cooper, 1984;) and dominant (Nienhuys, Horsborough, & Cross, 1985) than mothers of hearing preschoolers. Meadow, Greenberg, Erting, and Carmichael (1981) found that deaf preschoolers had shorter interactions with their mothers than did hearing preschoolers. Deaf preschoolers initiated interactions less frequently than did hearing preschoolers.

Although the effect of child hearing impairment on preschoolers' mother-child relationship has been studied, little is known about younger deaf children's relationship with their mothers. There are a few small-scale studies (n = 3 to 6 hearing impaired subjects) that suggest that this relationship may be less problematic than that of preschoolers. Mothers of hearing impaired infants still seem to dominate interaction. They initiated more and controlled the topic of interaction more than mothers of hearing infants (Spencer & Gutfreund, in press; Wedell-Monig & Lumley, 1980.) On the other hand, mothers and their hearing impaired infants were as responsive to each other as hearing infants and their mothers (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). In addition, the synchrony of face-to- face interaction is within the norms for hearing infants and their mothers (Nienhuys & Tikotin, 1985).

While this research is suggestive, any conclusions based on it must be tentative. Generalizing from small sample sizes is especially problematic among the hearing impaired population where large individual differences in social and communicative competence occur (Greenberg, 1980). In addition, these studies are

limited to examining differences in the frequency of behaviors. The major difference between deaf and hearing preschool dyads seems to be in the quality of the interaction (Schlesinger & Meadow, 1972). The primary goal of the present study was to contrast the relationships between hearing impaired toddlers and their hearing mothers with those of a matched group of hearing toddlers and their mothers. Toddlers were studied rather than infants because hearing impairment is rarely identified during infancy.

The mother-toddler relationship was measured in two ways. First, the quantity and quality of mother-toddler interaction during free play was examined using coding procedures similar to the ones used with deaf preschoolers (Greenberg, 1980; Schlesinger & Meadow, 1972).

Second, the quality of the attachment relationship between mother and toddler was examined using the Strange Situation paradigm (Ainsworth, Blehar, Waters & Wall, 1978). During the past decade, assessment of the security of the attachment bond, as described by Bowlby (1969) and Ainsworth (1973), has become a widely accepted way to describe the quality of the early mother-child relationship. Research suggests that security of attachment is related to the mother's sensitivity to the infant/toddler's needs and signals (Ainsworth et al., 1978). In addition to being an indicator of the mother-child relationship, the attachment relationship predicts social competence during the preschool years (Sroufe, 1988).

The only published study on the attachment relationship between hearing impaired children and their hearing parents used a modification of Ainsworth's procedure to examine the development of attachment among deaf preschoolers (Greenberg & Marvin, 1979). Deaf preschoolers who communicated poorly with their mothers were more delayed in the development of a mature (goal-directed partnership) attachment relationship and more likely to show behaviors indicative of an insecure attachment than deaf preschoolers who communicated well with their mothers (Greenberg & Marvin, 1979). Similarly, deaf children of deaf parents (and thus with high communication skills) developed attachment similar to hearing children (Meadow, Greenberg, & Erting, 1985). This research suggests that only deaf children with poor communication skills are at risk for developing insecure attachments. However, this conclusion is tentative because these studies did not include hearing children nor use the traditional classification system for assessing attachment security.

Hearing impaired toddlers with hearing parents might be at risk for developing insecure attachments for several reasons. First, poor communication between hearing impaired toddlers and their mothers may lead to insecure attachments. Hearing impaired toddlers may perceive their mothers as being insensitive because their mothers respond to them with speech or vocalizations that the toddlers do not hear (Blacher & Meyer, 1983). Second, mothers of hearing impaired toddlers seem to dominate or control interaction (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). Deaf children may perceive this control as insensitivity. Finally, parents of hearing impaired children experience more stress than parents of hearing children (Friedrich, Greenberg, & Crnic, 1983) and maternal stress has been associated with attachment security (Vaughn, Egeland, Sroufe, & Waters, 1979).

On the other hand, there are some reasons to expect that hearing impaired toddlers are not at risk for developing insecure attachments. Hearing impaired infants/toddlers and their mothers seem to be as responsive to each other as hearing infants/toddlers and their mothers (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). In addition, hearing impaired toddlers may not

need to hear their mothers' voice because spoken responses are frequently redundant with nonverbal visual communication. This is probably why interaction between hearing impaired infants and their mothers appears synchronous (Nienhuys and Tikotin, 1985). Finally, research with other "at risk" infants suggests that the early attachment relationship may only be affected by extreme risk factors (Easterbrooks, 1989; Goldberg, 1988; Shapiro, Sherman, Calamari, & Koch, 1987; Sierra, 1989; Stahlecker & Cohen, 1985; Wasserman, Lennon, Allen, & Shilansky, 1987).

In summary, the impact of child hearing impairment on the mother- toddler relationship was examined by assessing security of attachment, and the quality and quantity of mother-toddler interaction during free play. The subjects included almost all hearing impaired toddlers enrolled in parent education programs in a major metropolitan area over a five year period. The results therefore are able to be generalized to hearing impaired toddlers enrolled in parent education programs. To ensure the results also apply to subgroups of this population two additional analyses were conducted. One compared the mother-toddler relationship of 30 profoundly deaf toddlers with that of a matched group of hearing toddlers. The second examined the impact of age of identification and intervention on the mother-toddler relationship.

Method

Subjects

This study included the 41 hearing impaired toddlers who were between 18 and 25 months of age (M age = 22 months) and their hearing mothers described above. From the sample of 54 hearing subjects, 41 toddlers were selected who were the same age as the hearing impaired toddlers (age range=18-25 mons; M age = 22 mons). The hearing dyads were matched with the hearing impaired dyads on sex of child, ethnicity, family status, maternal employment and education. The Hodge-Siegel-Rossi Index (1972) was used to assign prestige scores for maternal and paternal occupations. There were no significant differences between the two groups on maternal occupation, and paternal education and occupation.

Coding Procedures

The mother-toddler relationship was assessed in three ways: quality of attachment, quantity of interaction, and quality of interaction.

Attachment. From the videotapes of the Strange Situation, security of attachment was classified into three force-choiced groups: Avoidant (A), Secure (B), Resistant (C) using Ainsworth's standard classification scheme (Ainsworth et al., 1978). Researchers have recently questioned the appropriateness of this traditional scheme for assessing the attachment of handicapped children (Goldberg, Fisher- Fay, Simmons, Fowler, & Levison, 1989; Sierra, 1989; Stahlecker & Cohen, 1985). Classifying attachment of handicapped children as A, B, or C was more difficult in these studies than classifying nonhandicapped children. To see if this was also true with hearing impaired toddlers, coders were asked to categorize the tapes as difficult or not. In addition, attachment was further classified as disorganized/disordered (D) or organized (Main & Solomon, 1986). Tapes were coded by two developmental psychologists who were highly trained in scoring attachment from the Strange Situation (Drs. Margaret Owen and James Stahlecker.) The latter also has extensive experience with deaf children. The two coders had established high reliability with each other on a different sample of handicapped children prior to this study. The tapes were randomly distributed between the two coders. Thirteen hearing impaired toddlers and 11 hearing toddlers were judged difficult to classify and were therefore

classified independently by the other coder. This distribution of "difficult tapes" suggests that the coding of the hearing impaired and hearing toddlers' attachment was of equal difficulty. Interrater reliability on these difficult tapes was 83%. Differences were resolved by conferencing.

Quantity of interaction. (see Appendix A for coding manual). Mother-toddler interaction during the 15 min free play was coded using an event sample coding procedure (Lederberg, 1984). Frequency and success rate of initiations, frequency and duration of interactions, and frequency and reason for terminations were coded. An initiation was defined as the first socially-directed behavior that occurred after a 3-sec period of noninteractive activity. An initiation was successful if it received a social response within 3 sec. An interaction started with a successful initiation and continued until there was a 3-sec period without any socially directed behaviors. The person who did not respond to the last socially directed act of an interaction was coded as the terminator of that interaction. The frequency with which terminations occurred because the communication was not received by the partner (e.g., a gesture out of visual range) was also noted.

A third pair of researchers, blind to attachment classifications, coded the quantity of interaction. After all play sessions were coded, 20 randomly selected play sessions, evenly distributed between hearing impaired and hearing dyads, were recoded by the same coders. Interrater reliability, calculated using the formula Agreements/Disagreements + Agreements, for the above described variables ranged from 79% to 95% with a mean of 86%.

Quality of interaction. (see Apendix A for coding manual). The quality of mother-toddler interaction was coded using 5-point Likert-like rating scales adapted from ones by Schlesinger and Meadow (1972) and Crawley and Spiker (1983). Two researchers independently coded all tapes for maternal behavior and the dyadic scale for communicative competence. Another two researchers independently coded all tapes for toddler behavior and two dyadic scales. All research assistants were blind to the toddlers' attachment classifications. Interrater reliability for exact agreement between members of the pairs of coders, calculated using Cohen's kappa, is noted below.

Maternal behavior was coded along the following nine dimensions: Didactiveness (use of a formal teaching style, κ=.95), directiveness (degree of direct guidance the mother offers the child, =.99), stimulation value (cognitive stimulation value of maternal behavior, κ=.98), intrusiveness (amount the mother disrupts the child's behavior, κ=.97), pacing (appropriateness of the rate the mother guides activities, κ =.98), developmental appropriateness of play (appropriateness of activities for the child's abilities, κ=1.00), positive affect (amount of positive feelings expressed, κ=.91), negative affect (amount of negative feelings expressed, κ=.99), positive reinforcement (frequency and intensity of appropriate reinforcement of the child's behavior, κ=.93).

Toddler behavior was rated along the following nine dimensions: social initiative (frequency and intensity of initiations, κ =.86), social responsiveness, (child compliance to maternal initiations and requests, κ =.75), affective sharing (the amount of enthusiasm and interest the child shows in interactions with mother, κ =.75), positive affect (amount of positive feelings expressed, κ =.79), negative affect (amount of negative feelings expressed, κ =.93), attention span/distractability (degree the child is persistent in attempting to master tasks, whether successful or not, κ=.61), object initiative (amount of object-directed behavior the child engages in, independent of maternal prompting, κ=.76), pride in mastery (the expression of positive affect and pride

following task accomplishment, κ=.92), and creativity (imagination and creativity of child's play, κ=.84).

In addition, the dyad was rated along three dimensions: mutuality (degree to which interactions are harmonious and in sinc, κ =.80); dominance (degree to which mother or child dominates interaction) κ =.77); communication competence (the degree that both mother and child display mutual and reciprocal understanding of each other's communicative acts, κ=.97).

Results

Quality of Attachment

A 3 (attachment security) x 2 (hearing status) chi-square analysis indicated no significant differences in the distribution of A, B, and C type attachments for the hearing impaired and hearing toddlers, $\chi^2(2, N = 82) = 3.81$, $p < .15$ (See Table 1). In fact, the number of securely and insecurely attached hearing

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Insert Table 1 about here

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impaired and hearing toddlers was almost identical. There were also no significant differences in the number of D classifications for the hearing impaired and hearing toddlers, $(1, N=82) = 3.10$. $p < .10$ ($n = 10$, 4 respectively). For further analyses, D classifications were force-classified as A, B, or C type attachments (hearing impaired = 3As, 1B, 6Cs; hearing = 2A, 1B, 1C).

Mother-Toddler Interaction

The next series of analysis tested the effect of hearing impairment on mother-toddler interaction and explored the possibility that mother-toddler interaction is affected by an interaction between hearing status and attachment security.

Quantity of interaction. To test for effects on the quantity of interaction, 2 (hearing impaired vs. hearing) x 2 (secure-B vs. insecure-A & C attachment) ANOVAs were conducted on the following variables: frequency and duration of interaction; frequency, average duration, and success rate of both maternal and child initiations; proportion of interactions terminated by child; and proportion of interactions terminated because the child did not receive the communication.[3]

Hearing status affected the quantity of interaction in three ways. First, hearing impaired toddlers and their mothers spent less time interacting than did hearing toddlers and their mothers, $F(1,78) = 6.55$, $p < .01$, (M = 682 sec and 764 sec, respectively). Perhaps to try to compensate for this decrease in interaction, mothers of hearing impaired toddlers initiated more to their children than did mothers of hearing toddlers, $F(1,73) = 12.24$, $p < .001$, (M = 11.46 and 6.82, respectively). Finally, hearing impaired toddlers were much more likely to terminate an interaction because they did not see or hear the last communication by their mothers than were hearing toddlers, $F(1,70) = 20.75$, $p < .0001$, (M = 18% and 0% of terminations by hearing impaired and hearing toddlers, respectively). There were no significant differences in any of the other measures.

None of the measures showed a significant interaction between hearing status and attachment nor a significant effect of attachment.

Quality of Interaction. Ratings of mother-toddler interaction were analyzed using three 2 (hearing status) x 2 (attachment security) Multivariate Analyses of Variance (MANOVAs). One MANOVA included the nine ratings of maternal behavior, one included the nine ratings of toddler behavior, and one included the three ratings of dyadic behavior. ANOVAs were computed for individual ratings

when the overall MANOVA was significant.

Hearing impairment exerted only a minimal impact on the global ratings of mother-toddler interaction either as a main effect or in interaction with attachment security. Only the dyadic MANOVA showed a significant effect for hearing status, $F(3, 76) = 3.52$, $p < .02$. Hearing impaired dyads were less communicatively competent ($M = 2.7$) than hearing dyads ($M = 3.5$), $F(1, 78) = 10.55$, $p < .01$. There were no other significant multivariate or univariate differences between hearing impaired and hearing toddlers or between their mothers. Security of attachment and hearing status only showed a significant interaction for maternal behavior, $F(10, 69) = 1.98$, $p < .05$, with only a significant univariate effect for negative affect, $F(1, 78) = 6.20$, $p < .05$. Mothers of insecurely attached hearing toddlers expressed more negative affect than mothers of insecurely attached hearing impaired toddlers, securely attached hearing impaired toddlers, and securely attached hearing toddlers.

Security of attachment showed significant but minimal effects on maternal behavior, $F(9, 70) = 2.02$, $p < .05$ and more extensive effects on toddler behavior, $F(9, 70) = 2.03$, $p < .05$. Mothers of securely attached toddlers reinforced their children more than did mothers of insecurely attached toddlers, $F(1, 78) = 16.56$, $p < .01$. Securely attached toddlers initiated more, $F(1, 78) = 4.57$, $p < .05$, and responded more to their mothers, $F(1, 78) = 4.62$, $p < .05$, showed more affective sharing, $F(1, 78) = 5.32$, $p < .05$, had a longer attention span, $F(1, 78) = 12.89$, $p < .001$, and were more likely to show pride after completing a task, $F(1, 78) = 10.27$, $p < .001$, than insecurely attached toddlers.

Analyses with Deaf Toddlers.

In order to ensure that the results could be generalized to profoundly deaf toddlers, all the analyses were repeated using only data from 30 deaf toddlers and 30 matched hearing toddlers. There were no differences between these results and those reported previously. Security of attachment did not differ between the profoundly deaf and hearing dyads, $(1, N=60) = .278$, $p < .59$ (n secure = 17, 19, respectively), nor did the number of disorganized attachments differ significantly, ($n = 4, 2$, respectively). As with the whole sample, the only effect of deafness on quality of interaction was to decrease dyadic communicative competence. Finally, deaf dyads interacted for less time, had more maternal initiations, and had more terminations due to miscommunication than hearing dyads.

Ages of identification and intervention.

To determine whether differences in attachment were related to either the age that children were identified as hearing impaired or the number of months enrolled in intervention, t-tests (secure vs. insecure attachment) were conducted using these two variables as dependent variables. In addition, age of identification and months in intervention were correlated with all interaction measures. Ages of identification and intervention were not significantly related to attachment or any measure of mother-toddler interaction.

Discussion

As expected, hearing impairment affected the ability of mother and toddler to communicate effectively. Hearing impaired toddlers and their mothers were judged to miscommunicate much more frequently than hearing toddlers and their mothers. Consistent with this global rating, hearing impaired toddlers frequently did not respond to their mothers' communication because they did not seem to hear or see it. These problems probably result from the need to communicate visually. Unlike hearing children who can listen to speech while visually attending to objects, deaf children have to divide their visual

visually attending to objects, deaf children have to divide their visual attention between the environment and the communicator in order to receive the communication. Learning to coordinate their visual attention appropriately is one of the major learning tasks that hearing impaired children have to accomplish and it may not be completed until well into the preschool years (Wood, Wood, Griffiths, & Howarth, 1986). In addition, hearing parents have to learn to coordinate their communication with their child's attention (Spencer & Gutfreund, in press). The hearing impaired toddlers and their mothers spent less time interacting than hearing toddlers and their mothers. This may also have been caused by the hearing impaired toddlers' difficulty attending to their mother while playing with the toys in the room. Finally, similar to past research (Wedell-Monnig & Lumley, 1980), mothers of hearing impaired toddlers initiated interactions more than mothers of hearing toddlers. Others have interpreted this increase in maternal initiation as an increase in maternal directiveness or dominance (e. g., Jones, 1980; Wedell-Monnig & Lumley, 1980). However, in the present study, mothers of hearing impaired and hearing toddlers did not differ on qualitative ratings of dominance or directiveness. Thus, although mothers of hearing impaired toddlers may have been more responsible for starting an interaction, these mothers were as likely as mothers of hearing children to allow their child to set the topic and to control the interaction. Given that an initiation is defined as the first social behavior following noninteraction, mothers of hearing impaired toddlers may just have had more opportunity to initiate interactions because the dyads spent less time interacting.

Despite these effects on communication and quantity of interaction, hearing impairment did not affect the quality of the relationship between mother and toddler. Ratings of the quality of maternal and toddler behavior during free play were similar for the hearing impaired and hearing dyads. Thus, the two groups of mothers did not differ on affect, sensitivity, control or teaching behavior. The hearing impaired and hearing toddlers did not differ on initiative, compliance, affect, attention span, pride in mastery or creativity. Consistent with the lack of differences in quality of interaction, there were no differences in the hearing impaired and hearing toddlers' security of attachment to mother.

Unlike other handicapped populations, hearing impaired children were not more difficult to classify and did not show significantly more disorganized attachments than hearing toddlers. In addition, mother-toddler interaction and security of attachment were related in similar ways for both hearing impaired and hearing toddlers. Securely attached toddlers were happier, more socially interactive and compliant, had longer attention spans and showed more pride in mastery than insecurely attached toddlers. Mothers of secure toddlers reinforced them more than mothers of insecure toddlers. The fact that relations between attachment and maternal-toddler behavior were the same for both hearing impaired and hearing toddlers and are consistent with attachment theory suggests that both the Strange Situation and the standard coding procedure were a valid assessment of the hearing impaired toddlers' quality of attachment.

Thus, despite their communicative difficulties and their delayed language development, hearing impaired toddlers were as likely to establish a positive, reciprocal, secure relationship with their mothers as were hearing toddlers. This was true for the subsample of profoundly deaf toddlers as well as for the whole sample. The results, together with past research, suggests that "sensitive" caregivers can adapt to a variety of special needs of their

infants/toddlers is such a way as to make their children feel secure in their care. Caregivers seem to be able to adapt to the needs of children who are hearing impaired, premature, neurologically impaired, physically impaired or have difficult temperaments (Goldberg, 1988; Stahlecker & Cohen, 1985; Vaughn, Lefever, Seifer, & Barglow, 1989; Wasserman, et al., 1987). As Goldberg (1988) points out, this supports Ainsworth's hypothesis that the quality of the early attachment relationship is more dependent on maternal than infant characteristics (Ainsworth et al., 1978).

With hearing impaired children, maternal adaptation probably entails using enough visual and physical communication that hearing impaired toddlers feel that their needs are being met. Thus, for example, the hearing impaired toddler would not need to hear their mother's comforting voice because their mother is also communicating that comfort visually and physically through body language. It is likely, even before the mother knows her child is hearing impaired, that the infant shapes appropriate responses from her by not being comforted by responses that are solely auditory. These adaptations did not seem to be due to educational intervention, since the number of months the dyads were enrolled in intervention programs did not relate to any measure of interaction.

The findings in the present study together with past research with preschool children (Meadow et al., 1981; Schlesinger & Meadow, 1972) suggest that the impact of hearing impairment on mother-child interaction increases from toddlerhood to preschool. This change may be due to a developmental change in the importance of language for normal mother-child interaction. The poor quality of interaction between deaf preschoolers and their mothers seem to be due to communication problems (Greenberg, 1980; Schlesinger & Meadow, 1972). In contrast, in the present study, although hearing impairment affected communication, this effect did not, in turn, affect the mother-toddler social relationship in a major way. The inability to communicate effectively and to use language may become more disruptive to the mother-child relationship as the children get older because age appropriate activities become more dependent on language and good communication.

On the other hand, differences between our results and those with preschoolers may be caused by differences in the characteristics of the hearing impaired children studied. In the present study, by necessity, only hearing impaired toddlers already identified as such and enrolled in an intervention program were studied. There may be more insecure attachments and worse social interaction patterns between hearing impaired toddlers and parents who are not sensitive enough to notice or to seek help for a hearing problem until that child is older. Unlike the present study, the studies with preschool children included children who were identified after 2 years of age. Thus, the apparent deterioration of the mother-child relationship may just be caused by inclusion of these late identified children in the preschool studies. In support of this explanation, in the research by Greenberg and colleagues (1979, 1980, 1981), the average age of identification of the high communicatively competent children was 13 months (similar to the present study), while the average age of identification for the low communicatively competent children was 21 months. It was the latter children that seemed to account for most of the effects of hearing impairment. This possibility highlights the importance of longitudinal research for understanding developmental changes in the impact of hearing impairment on the mother-child relationship. The effect of deafness on the quality of interaction when the children were 3 year olds was next assessed to help determine which of these explanations is correct.

Method

Subjects: Thirty-three hearing impaired and 33 hearing children and their hearing mothers served as subjects. The hearing impaired/hearing dyads were matched on sex of child, ethnicity, and maternal marital status, work status, and education. These included all the hearing impaired subjects who continued in the study at 3 years of age and a matched group of hearing subjects.

Procedure: The quality of mother-child interaction during 15 min free play and 5 min problem-solving (puzzle completion) sessions was rated using 5 or 7 point Likert scales used when the children were 22 months old. Interrater reliability (based on 25% of tapes) ranged from χ = .61 to 1.00.

Results

A series of 2 (child hearing status) X 2 (child age) repeated measures ANOVAs were conducted. Whenever there was a significant interaction, the effect of child hearing status for each age was tested using planned comparisons. Table 2 displays the ratings that showed significant differences. As expected, there was a significant interaction between child deafness and child age for many of the rating scale. As reported for the larger sample of 22 month olds, the hearing impaired and hearing dyads differed at 22 months only on communicative competence. In contrast, hearing impaired 3-year-olds showed significantly less social initiative, social compliance or responsivity, enthusiasm and interest (affect sharing), creative play and more misbehavior while playing with their mothers than did hearing 3-year-olds. In addition, during the puzzle task, the hearing impaired 3-year-olds showed less on-task behavior (task orientation) and less enthusiasm (affect) than did hearing 3-year-olds. During free play, the hearing impaired dyads showed less communicative competence, less harmonious interaction (mutuality), and more maternal dominance than hearing dyads.

The findings in the present study suggest that child deafness begins to dramatically impact on the quality of mother-child interaction between 22 months and 3 years of age. This may be due, in part, to the increased dependence of age appropriate activities on language and good communication. The results suggest that, at a time when parental support is decreasing (as the children enter center based programs and leave parent education programs), such support should be increasing.

MOTHER-CHILD COMMUNICATION

The last analysis that has been finished on the data collected for the project is an examination of the impact of deafness on the mother-child communication. Deaf infants and toddlers are usually enrolled in parent intervention programs that frequently focus on communication between mother and child. Yet we know little about the impact of deafness on the communication between mother and young child. The few small scale studies (n = 3-8 deaf children) done suggest that deafness impacts communication along multiple dimensions. First, child deafness may decrease the degree to which the topic of communication is established by the child, rather than the mother. Spencer and Gutfreund (in press) found that communication between hearing impaired 12-month-olds was less likely to be about something the infants showed an interest in (and more likely something the mother spontaneously thought of) than communication between hearing infants and their mothers during face-to-face interaction. Similarly, mothers of oral deaf two and a-half-year-olds were more likely to talk about their own activities rather than the child's than mothers of hearing children of any age (Cross, Johnson-Morris, & Nienhuys, 1980.)

Thus, maternal topic control, an area where research with normal language learning children can have a detrimental effect on language acquisition, seems to be a potential problem for hearing impaired children. However, the only extensive study of communication between deaf children and their hearing mothers (n= 28 deaf preschoolers) found hearing mothers of deaf preschoolers actually made FEWER references to themselves than mothers of hearing preschoolers (Meadow, Greenberg, Erting, & Carmichael, 1981).

Along pragmatic dimensions, mothers of deaf 2-year-olds used more action directives, protests, attention-getters, fewer suggestions, acknowledgements than hearing 2 year olds (Cross, Nienhuys, & Kirkman, 1985). Similarly, mothers of oral deaf preschoolers use more action directives, attention-getters and fewer acknowledgements, and verbal praise than mothers of hearing preschoolers (Brinich, 1980; Hennegeler, Watson, & Cooper, 1984; Hyde, Elias, & Power, 1981; Meadow et al., 1981). However, Meadow et al. (1981) found mothers of deaf preschoolers using total communication did not use more action directives than mothers of hearing preschoolers.

In terms of discourse features, mothers of oral deaf toddlers and preschoolers were more repetitive and talkative than mothers of hearing children (Cross et al., 1985; Wedell-Monig & Westermann, 1981). Meadow et al. (1981) found that mothers of simultaneous communication deaf preschoolers were not more repetitive or talkative than mothers of hearing preschoolers.

The few studies done on deaf children's communicative development have found differences between deaf and hearing children on many dimensions during the preschool years. Deaf children communicated less and used less spontaneous communications (i.e., communication that was not a direct response to mother's communication) than hearing children (Meadow et al., 1981). They asked fewer questions, made fewer references to their activities/feelings, referred to objects more, and imitated their mothers more than mother than did hearing children (Brinich, 1980; Meadow et al., 1981).

The major goal of the present study was to examine the impact of deafness on mother-child communication from 22 months to 3 years. The only other existing longitudinal study (Cross et al., 1985) only examined speech communication, clearly a problem when looking at communication with deaf children.

Method

Subjects. Because the degree of hearing impairment is central to communication, only profound deaf children were included in this study. Because ethnicity also can have a major impact on communication, only white subjects (the only group that had a large enough sample) served as subjects. The 20 white deaf children and their mothers who participated in the study at 22 months and 3 years of age served as subjects. Twenty hearing dyads were selected out of the larger sample who matched the deaf children on sex of child and marital status.

Procedures. All communication between mother and toddler in the middle 5-min of the free play session was coded from videotapes using a microanalysis coding scheme (an adaptation of PICCS by Greenberg, Slough, and Crnic, 1984; see Appendix A for coding manual). This scheme codes every communicative utterance along five dimensions: (a) modality (verbalization, vocalization, visual, sign, attentional touch) (b) pragmatic category (c) dialogue connection (spontaneous addition of new information, responsive to other's social behavior, reactive to other's nonsocial behavior, imitation, self-repetition) (4) topic maintenance (new or maintained topic) (5) topic cohesion (whether mother and child are focused on the same or different topics). In addition, the mother's communications were coded as to whether the child saw the communication or not.

Results

These measures of communication were analyzed using a series of 2 (hearing status) x 2 (age) repeated measures ANOVAs. Whenever there was an interaction between hearing status and age, planned comparisons were conducted comparing deaf and hearing children's communication at each age.

Children's communication

Table 3 shows all means for variables that showed significant main effects for hearing status and/or interaction effects of age and hearing status on child communication. Several aspects showed an effect for hearing status that were not qualified by an interaction with age. Not surprisingly, deaf children's utterances were less likely to contain verbalizations and more likely to contain vocalizations than hearing children's. Deaf children's utterances were more likely to start a new topic (and thus less likely to continue an old topic), and more likely to focus on something the mother was not focused in on than hearing children. There were also pragmatic differences: Deaf children's utterances were more likely to be directives and less likely to be questions than hearing children's. They were also more likely not to be able to be classified by pragmatic type (this was true primarily for vocalizations).

As is evident from Table 3, many variables showed a significant hearing status x age interaction. For many aspects of communication, differences between the deaf and hearing children only became evident at age 3. At 3 years of age (but not at 22 months), deaf children communicated significantly less than hearing children. Significant increases in visual communication did not occur until 3 years of age, at which time deaf children's utterances were more likely to contain signs, gestures and to be bimodal than hearing children. Probably due to the deaf children's language delay, hearing children were more likely to imitate their mothers than deaf children at 22 months, while deaf children were more likely to imitate their mothers at 3 years.

Mother's communication

Table 4 shows all means for variables that showed significant main effects for hearing status and/or interaction effects of age and hearing status for maternal communication. There were several effects of hearing status that were not affected by child age. Like their children, mothers of deaf children were more likely to communicate about a new topic (rather than maintain an old one) than mothers of hearing children. Mothers of deaf children touched their children and used more action directives than mothers of hearing children. Not surprisingly, mothers of deaf children repeated their communication much more than mothers of hearing children. When these repetitions were excluded, the only difference on measures of "dialogue connection" was that more communication by mothers of deaf children occurred when the children were ignoring them and not being social (coded as reactions). Contrary to past research, mothers of deaf children were NOT less responsive to their children's communication or activities.

Other variables showed an interaction between age and hearing status. As deaf children grew older, mothers of deaf children verbalized less and signed more, with significant differences only occurring at 3 years of age. Communication by mothers of deaf children was more likely to contain gestures and be bimodal at both ages, but differences between communication to deaf and hearing children was greater at 3 than at 2 years of age. Differences in the pragmatics of communication also increased as the children grew older. Mothers of deaf children used fewer positive utterances and more attentionals utterances at 3 years (but not at 2 years) than mothers of hearing children.

Finally, the proportion of maternal utterances that were "seen" by the deaf

children increased 50% between 2 and 3 years of age, while there was not any change for the hearing children.

Discussion

Deaf children's communication differed from hearing children's along every dimension. As expected they used more visual and little verbal communication. They seemed less "tuned in" to the dialogue with their mother, more frequently communicating about something other than what their mother was attending to. They also were more likely to start a new topic rather than continue one. Consistent with their language delay, the deaf children only imitated their mother's communication at 3 years, and were more likely to direct than question their mother. This is probably because it is easier to command using nonverbal communication (e.g., with a point) than to ask a question.

Mothers of deaf children seemed to be adapting their communication to their children's communication needs, especially by 3 years of age. They used more visual and bimodal communication, and repeated their utterances more than mothers of hearing children. They also touched and used attentional utterances more than mothers of hearing children. Unfortunately, by age 3, mothers of deaf children also verbalized less. Although this can be seen as an adaptation to their children's lack of response to auditory input, it also means that these children are getting even less input than hearing children to develop their oral skills.

At 22 months, the majority of maternal communication was not visually attended to by deaf children. Therefore, although mothers were communicating alot with their deaf toddlers, one can assume those toddlers were "receiving" very few of those communications. By 3 years, deaf children and their mothers had learned to coordinate maternal communication with child attention better, although a third of the mother's utterances were still not "seen" by the child. Therefore, deaf 3-year-olds were probably still getting less communicative input than hearing 3-year-olds.

As others have found, mothers of deaf children used language to control their child's actions and were less positive at 3 years than mothers of hearing children. Research with hearing children suggests that this may also contribute to deaf children's language delay. Contrary to the findings in small scale studies, mothers of deaf children did not exert more topic control than mothers of hearing children. Their communications were just as responsive to the children's actions and communications as mothers of hearing children. Therefore, mothers of deaf children were not hindering their children's language by not being sensitive to their children's activities.

The results suggest that intervention with mothers of deaf children should concentrate on the problem of coordination between communication and child attention and pragmatics of maternal communication, but NOT on topic control.

ANTECEDENTS OF LANGUAGE AND SOCIO-EMOTIONAL COMPETENCE

Because it took more time than anticipated to code the videotapes, I have not been able to conduct the analyses necessary to describe relations between the mother-child relationship and language competence and socio-emotional competence. However, all relevant data is entered into the computer and I plan to conduct, and write up these results over the next few years. As I publish these results, as well as those describing the preceding analyses I will send them to the Office of Special Education.

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Table 1
Attachment Classifications for Hearing Impaired and Hearing Toddlers

Toddlers	Attachment Classification		
	Secure	Insecure	
		Avoidant	Ambivalent/Resistant
Hearing Impaired	23	9	9
Hearing	25	13	3

Table 2. Mean Scores and Significance of ANOVAs and Planned Comparisons for Ratings of Mother-Child Interaction

Scales	Age	Deaf	Hearing	Planned Comparisons[a]	ANOVA Significance
CHILD RATINGS					
Social Initiative	22 mos.	2.9	2.9	n.s.	Hearing
	3 yrs.	2.8	3.8	***	Hearing x Age
Social Responsivity	22 mos.	3.4	3.5	n.s.	Hearing
	3 yrs.	2.6	4.1	***	Hearing x Age
Affect Sharing	22 mos.	3.6	4.0	*	Hearing
	3 yrs.	3.3	3.8	**	Age
Creative	22 mos.	2.1	2.2	n.s.	Hearing
	3 yrs.	3.6	4.3	**	Age
					Hearing x Age
Misbehavior	22 mos.	1.0	1.3	n.s.	Age
	3 yrs.	.8	.4	**	Hearing x Age
Task Orientation	22 mos.	3.5	3.2	n.s.	Hearing x Age
	3 yrs.	2.7	3.4	*	
Affect	22 mos.	3.8	3.9	n.s.	Hearing
	3 yrs.	3.4	4.1	**	Hearing x Age
DYADIC RATINGS					
Communicative Competence	22 mos.	2.7	3.5		Hearing
	3 yrs.	2.4	4.6		
Mutuality	22 mos.	3.6	3.8	n.s.	Hearing
	3 yrs.	2.9	3.7	***	Age
					Hearing x Age
Domination of Interaction	22 mos.	5.1	5.3	n.s.	Age
	3 yrs.	3.4	2.9	*	Hearing x Age

[a] Significant effects of child deafness within each age
* $p < .05$ ** $p < .01$ *** $p < .001$

Table 3. Mean Proportion and Significance of ANOVAs and Planned Comparisons for Communication by Hearing and Hearing Impaired Children

Variables	Age	Deaf	Hearing	Planned Comparisons[a]	ANOVA Significance
Number of Utterances	22 mos.	25	32	n.s.	Hearing
	3 yrs.	41	69	***	Hearing x Age
Topic					
New Topic	22 mos.	.08	.05		Hearing
	3 yrs.	.07	.05		
Different Topic from Mother	22 mos.	.09	.03		Hearing
	3 yrs.	.02	.006		
Modality					
Sign	22 mos.	.04	.00	n.s.	Hearing
	3 yrs.	.14	.00	***	Hearing x Age
Visual	22 mos.	.17	.10	n.s.	Hearing
	3 yrs.	.36	.10	***	Hearing x Age
Verbal	22 mos.	.10	.53	***	Hearing
	3 yrs.	.26	.84	***	Hearing x Age
Vocal	22 mos.	.75	.44		Hearing
	3 yrs.	.41	.13		
Bimodal	22 mos.	.07	.06	n.s.	Hearing
	3 yrs.	.16	.07	**	Hearing x Age
Dialogue Connection					
Imitation	22 mos.	.03	.11	*	Hearing x Age
	3 yrs.	.06	.01	*	
Pragmatic Category					
Statement	22 mos.	.16	.42	***	Hearing
	3 yrs.	.28	.36	n.s.	Hearing x Age
Direct	22 mos.	.17	.10		Hearing
	3 yrs.	.36	.10		
Question	22 mos.	.02	.05		Hearing
	3 yrs.	.04	.08		
Unclassifiable	22 mos.	.67	.47		Hearing
	3 yrs.	.42	.22		

[a] Significant effects of child deafness within each age
n.s. not significant * $p < .05$ ** $p < .01$ *** $p < .001$

Table 4. Mean Proportion and Significance of ANOVAs and Planned Comparisons for Communication by Mothers to their Hearing and Deaf Children .

Variables	Age	Deaf	Hearing	Planned Comparisons[a]	ANOVA Significance
Topic					
New Topic	22 mos.	.05	.03		Hearing
	3 yrs.	.04	.02		
Modality					
Sign	22 mos.	.06	.00	*	Hearing
	3 yrs.	.24	.00	***	Hearing x Age
Touch	22 mos.	.03	.00		Hearing
	3 yrs.	.03	.00		
Visual	22 mos.	.19	.09	**	Hearing
	3 yrs.	.33	.10	***	Hearing x Age
Verbal	22 mos.	.84	.91	n.s.	Hearing
	3 yrs.	.80	.91	**	Hearing x Age
Bimodal	22 mos.	.23	.08	***	Hearing
	3 yrs.	.39	.10	***	Hearing x Age
Dialogue Connection					
Repetition	22 mos.	.19	.14		Hearing
	3 yrs.	.12	.02		
Reactive	22 mos.	.06	.02		Hearing
	3 yrs.	.02	.01		
Pragmatic Category					
Direct Directives	22 mos.	.22	.15		Hearing
	3 yrs.	.16	.08		
Attention Directives	22 mos.	.05	.05	n.s.	Hearing
	3 yrs.	.08	.02	***	Hearing x Age
Positive Statement	22 mos.	.12	.10	n.s.	Hearing x Age
	3 yrs.	.10	.17	**	
Visual Attention					
Utterances Seen by Child	22 mos.	.42	.32	*	Hearing
	3 yrs.	.67	.26	***	Hearing x Age

[a] Significant effects of child deafness within each age
n.s. not significant * $p < .05$ ** $p < .01$ *** $p < .001$

APPENDIX A

CODING MANUALS

MICROANALYSIS OF COMMUNICATION BETWEEN MOTHER AND CHILD

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This is an updated manual for coding the communication between mothers and their deaf and hearing children. A major portion of this manual was copied directly from the Parent-Infant Communication Scoring System (PICSS) (Greenberg, Slough, & Crnic, 1984.) However, quotation marks are not used when referring to the original source. Changes were made in the PICSS as needed to capture the differences relevant to hearing impaired children.

Coding the communication between mother (M) and child (C) involves transcribing each communicative "utterance" sequentially. Six different dimensions are used to classify each of M's utterances; five different dimensions are used with C's utterances. Each dimension has several categories which further clarify and define each utterance. The guidelines for coding in each dimension apply to both M and C, unless otherwise specified. For each utterance, coding is based solely on the actor's intent, not the recipient's interpretation of it.

This method for coding communication distinguishes between nonsocial, social, and communicative behavior. The focus here is to code communicative behavior. For discriminative purposes, nonsocial and social behaviors are described below.

Nonsocial Behavior

A nonsocial behavior is any act that is not directed to another person. This type of behavior is seen when a subject is playing alone or talking to himself/herself. To determine if a person is being nonsocial, observe how much time has elapsed since the last communicative act. Generally, if the person has not looked at, or talked to, the partner for three seconds, then the behavior can be considered to be nonsocial. If, however, the behavior is object related, and began as a social activity, (e.g. if C says, "Go set the table", and M does) then the partner has six seconds to perform the behavior unless the act takes longer than six seconds. (Note: To determine if an activity needs to take longer than six seconds, ... At that time the partner becomes nonsocial providing that there has been no social behavior during or following the activity. For example, if the person is doing a monologue, and it is loud enough for the partner to hear, then treat this as social behavior.

Social Behavior

A social behavior is any act directed to another person. To classify a behavior as social, one should be 95% certain that it is directed toward a partner. It is not sufficient for the behavior to show only awareness or interest in the partner. Again, the actor's intent, not the recipient's interpretation of the behavior, is the relevant factor in determining if a behavior is social. To determine if a behavior is social or nonsocial, decide if the behavior the person is doing includes the partner. There are several criteria that can be helpful in making this decision; any one is sufficient.

(a) A social behavior is often accompanied by a look at the partner's face or in the partner's direction. Such a look is usually simultaneous with a social behavior but it may precede or follow the behavior. For example, C might have difficulty stacking blocks while looking at M simultaneously. If

C looks at M before and after the behavior, then the behavior is said to be bracketed by looks and, therefore, is social. Also, there may be times when a simultaneous look does not in and of itself define a behavior as social. For example, M could be looking at C while absent-mindedly moving a toy. Since such movement is not directed toward C, "looking" does not make the behavior social.

(b) A behavior is social if it is in response to the partner's command. For example, if M directs C to throw the ball and C complies, then C's behavior is social. A command may be either direct such as "Get the ball" or indirect such as "Do you want to play ball?" If C is already performing or starting to perform some action when M gives her command, then the action may not be a social response. Similarly, M might move an object in front of C as if to say "Look at this". If C then looks at the object, such behavior is not necessarily a response to M's command. C may be looking at the object because it "appeared" in front of him/her and not because it was M's request. In other words, it is only when an action is done in response to a request from the partner that it becomes social.

(c) Imitation of the partner is a social behavior. The behavior has to be clearly imitative (i.e., it must be in response to partner's behavior).

(d) A "new look" is coded as a social behavior. A "new look" is when a person, in response to another's behavior or to a startling event, turns (frequently with a head jerk) and looks at the partner as if to say "what happened?" Such a reaction is counted as a social behavior because it is clearly communicative.

(e) Talking to a toy or speaking "to one's self" is considered a social behavior if the partner functions as an "audience" for the speaker, or if it may be intended for the partner to overhear.

(f) At times, it can be difficult to distinguish between social and non-social vocalizations. Generally, there are four criteria that are helpful in determining whether or not an utterance is social. Meeting one of these criteria does not make an utterance "social" but meeting several of these criteria is a good indication that the vocalization is more social than non-social.

1. If M or C vocalizes in a timely fashion after partner's communication, as if responding to it, the vocalization may be social.

2. If the vocalizing individual is facing the partner or if the partner is within the peripheral vision of the speaker, then the vocalization may be social.

3. If the vocalization is on the same topic as the surrounding utterances, then it may be social. For example, sound effects performed during social pretend play are considered to be social.

4. If the vocalization has varied intonation (i.e., a conversational tone), then it may be a substitute for words and therefore, more social than non-social.

Don't decide if behavior is social on an utterance by utterance basis. Look at an entire episode. If the episode has been and continues to be social, then the utterance should be coded in that social context.

Communicative Behavior

Communicative behavior is social behavior that is done for the sole purpose of communicating information to another person. Information can be communicated verbally, vocally, visually, physically (i.e., object-related behavior), or through touch. Signs, gestures, and attention-getting devices are almost always communicative. Verbalizations are usually communicative, except when someone is "speaking to oneself." Use "looking"

behavior, topic, and intonation to distinguish self-directed speech from socially-directed speech. Vocalizations are sometimes non-social, and therefore non-communicative. Usually only those vocalizations which are accompanied by a look, or which occur in the middle of social pretend play, are counted as communicative. Because physical behaviors (i.e., object-related behavior) can be done for reasons other than communication, only certain types of physical behaviors are coded. Communication that is left incomplete (i.e., interrupted and not finished or started but rephrased before completion) is not coded.

Transcriptions

Each verbal, vocal or signed act is noted on a transcript as a series of utterances. M marks Mother's utterances; C marks Child's utterances.

How to determine an utterance

There are several criteria used to decide if speech contains one or more utterances. These criteria are attempts to standardize the intuitions of the authors. Given the limitations inherent in this task, sometimes one's "gut" feelings may be more accurate than the following requirements.

(a) The end of a complete thought or correct sentence structure (subject and verb) always marks the end of an utterance, even if there is no pause.

Example: There it is.
It's rolling away.

(b) If two complete sentences are joined by a conjunction, then they are coded as one utterance.

Example: There it is and it's rolling away.

(c) Vocals and fragments which occur at the beginning or ending of a sentence, such as Oh or Ok, are sometimes part of the larger utterance. Use pauses, intonation, and meaning to determine if it is one or two utterances.

Example: Ok, kick the ball.
See, it's over there.
Oh, you're a good boy!
You want to do that, huh?

(d) Pauses (longer than a breath) and intonations are used to determine if verbalizations and vocalizations are one or more utterances.

Example: More, more, more.
(This can be one, two, or three utterances.)

(e) If an utterance contains 2 different meanings, code it as 2 utterances if it can be justified by a pause. If the break down cannot be justified, code the utterance for overall meaning.

Example: No, I want you to do it.

(f) Visual communication occurring by itself can be divided into separate utterances according to meaning.

Utterance Boundries for Visual Communication

Visual and Verbal Acts:

If visual communicaton overlaps in time with verbal (or vocal) communication, even briefly, then the visual communication belongs in the same utterance as the verbal communication. However if the visual and verbal communication do not completely overlap (i.e., one starts before the other and their overlap is brief), the visual communicaton may be separated from the verbal communication if the visual communication has a different meaning or intent (i.e., represents a different thought).

Example: ATT. T.
"Do you want this?"
HeadNod
"They go together."

When a Visual communication overlaps two or more separate Verbal utterances, the Visual communication is coded with each Verbal utterance in which it overlaps at least one word.

Example: Two Visual/Verbal utterances:

POINT (held)
Look, there's a ball.
Let's play with it.

Example: One Visual/Verbal, and One Verbal only:

POINT (held)
The baby needs a blanket.
There's one over there.

When continuous (i.e., no pauses) signing occurs simultaneously with more than one verbal utterance, then the signing is divided according to the verbal communication it overlaps with.

Example: "Yes. That's right. Over there."
YES RIGHT Point.

When more than one visual act occurs simultaneously with a verbal utterance and there is a pause between the visual acts, consider the visual acts within the same utterance.

Example: "Yeah, you put the plate on the stove."
HeadNod PLATE Point

Visual (without Verbal) Acts:

Divide visual communicative acts into separate utterances when there is a pause between them, even if the previous visual act is held (i.e., maintained).

Example: 2 separate visual utterances:

Point (held)

HeadNod

2 separate visual utterances:

Gesture: Hands-palms up-(held)
I DON'T KNOW (signs)

3 separate visual utterances:

TELEPHONE (held)
Point (held)
TELEPHONE (wiggles previous sign)

Verbal utterances may be broken on the basis of even a very slight pause. If a pause is very brief between visual communication acts, the acts do not necessarily have to be divided. For example, if the visual acts flow as one idea or "sentence", they can be considered within the same utterance; or if the visual acts seem to represent different ideas, they can be divided on the basis of the slight pause.

When a person relaxes or drops (even slightly) their hands (or body) between signs (or between visual acts), then divide the signs or visual acts into separate utterances.

How to write a transcript

For verbal utterances, a word by word transcription is made. Vocalizations are noted as a (V). If vocalizations are standard sounds that convey meaningful content, (e.g., "Mhm." meaning yes) they are written out. For sign utterances, a separate act by act English transcript is completed. Visual and physical utterances do not get transcribed.

Coding from a transcript

For 18-month-olds coding begins 5 minutes after the freeplay session starts. For 3-year-olds coding begins 7 1\2 minutes after the freeplay starts. Five minutes of freeplay are coded for both age groups.

Transcriptions of all verbalizations and vocalizations are typed prior to coding. Communications that are made solely through visual or physical acts must be added to these transcripts. If a communication has a verbal and a visual component, verbalizations are used to determine the number of utterances while coding. For example, if M says "Look at the ball. The ball's over there." and holds one point throughout, then two utterances would be coded both having verbal and visual components.

After the utterances have been identified, they are coded on each of six dimensions: MODE, TIMING, TYPE, TOPIC, SYNCHRONICITY, and VISUAL ATTENTION. All utterances, including unintelligible speech are coded. Excluding the Mode dimension, each utterance receives only one code in each dimension, making this coding scheme mutually exclusive and exhaustive (Sackett, 1978). The only other exception is "Communication to Toy" which is coded along with, not instead of, the code of TYPE of communication.

Coding is done by a team of two coders. If there is any trouble in coming to an agreement when coding an utterance that has a default rule, discussion will be limited to one minute, and if agreement still cannot be obtained, then the default code will be used.

MODE

MODE is the manner in which each utterance is expressed (i.e., the chosen method of communication). Each utterance is classified into one of six MODES: Verbal, Vocal, Visual, Sign, Attentional Touch and Physical. If an utterance uses a combination of modalities, all MODES are coded (e.g., an utterance can be Verbal-Visual). There is only one exception to this rule. If an utterance is both Verbal and Vocal, it is only coded as Verbal. The rationale is that Verbal and Vocal are the same modality type (both using the vocal chords) and therefore only the most complex is noted.

Verbal

A Verbal utterance consists of real words as opposed to nonsense syllables or sound effects. C's attempts at words such as "ba" for ball are coded as Verbal. Take into account C's level of verbal ability to help determine whether C is trying to produce a word. For children with low verbal skills, give credit for verbalization if the utterance sounds like an imitation of M's word: i.e. has the same vowel sounds or other indications that it is an attempt at imitation. Listen to other utterances by the child. If all are the same, then they are probably vocalizations, but if one is different from other vocal sounds, and if the same sound pattern is used again under similar circumstances, or when signing the same word, then code it as an attempted Verbal. M's imitations of C's verbalizations are also coded as Verbal. Utterances such as "wow," "whee," "oops," "uh-huh," "mhm," "uhoh," and "huh?" are Verbal. Less standard, more questionable utterances that are not easily understood to be words are not coded under this category. An utterance that is unintelligible but has a sentence like structure, fluctuations in the voice, or at least one intelligible word is coded as Verbal.

When a Verbal utterance is accompanied by another Mode of communication, use the Verbal content to discern intent.

Vocal

A Vocal utterance consists of unrecognizable words. Humming, whistling, tongue clicking, screaming and other mouth sounds fall into the Vocal category. Also included are sound effects such as "choo-choo" or "vroom" except when they are used in sentences (e.g., "That's a choo-choo." and "The bus goes vroom.") "Oh," and "Ah," are Vocals. "Hey" is vocal unless it is extremely obvious that it is meant to carry a meaning (e.g. in "Hey! Pay attention." the "Hey" has an attentional meaning, and is coded as verbal). "Mmmm", meaning "yummy" is a vocal. M's imitation of C's vocalizations are Vocal. Non-language, involuntary sounds such as coughing,

sneezing, hiccoughing, or burping are not coded. Laughing is not coded unless it is clearly fake laughter, as is sometimes used for sound effects. An utterance which is difficult to understand is coded as a Vocal if 2 raters cannot reliably agree that it is a Verbalization.

Vocalizations are generally considered Responsive, however, there are times when a vocalization is clearly Spontaneous or Imitative. A clue to use when deciding if a Vocalization is responsive or spontaneous is to see whether it is followed by a Spontaneous or Responsive utterance. For example, "Hey" or "Oh" will be coded as Spontaneous if they are seen to be segways to a Spontaneous utterance. Vocalizations are rarely coded as Repetitions. To do so, the speaker must produce a duplication of a change in his/her previously established pattern of vocalizations or in cases where the vocalization is a more standard sound or a sound effect. Most vocalizations are coded as Fillers, but they can be coded differently if the intent clearly fits another Type category. For example, "shh" can be coded according to meaning, since there is only one possible interpretation.

Visual

A Visual utterance consists of any act using the head, hands, or body which communicates meaning. A distinction is made between visual communication and object-related behavior. To be coded Visual, not only must the act be meaningful, but an object may not be an important part of the communication. For example, if M waves around an object she wishes to show C, she is using the object as part of the communication. This action would not be coded as Visual. Visual would be coded only if M had referred to the object or communicated about the object using her body. The only exception is with a Point. A Point may be coded even if there is an object in the hand, and even if the object is used as part of the Point, as long as the intention of the person is to point to something other than the object being used to point.

The 5 types of Visual communication are described below:

(a) Point: Visual is coded when either partner uses a finger or hand to draw attention to an object or location. Holding an object in one hand and pointing to it with the other hand is coded as Visual. If M points at something, then her point is coded as Visual regardless of whether she has an object in her hand. Touching the object being pointed to is coded as Visual. Movement toward an object as if to grab it is not considered a point. Using hand to move an object is not considered a point.

An isolated point is coded as a Direct Directive General unless the point has only one possible intent, indicating possession or location (ie. mine, me, here). If combined with an attentional verbalization, a point is coded as a Direct Directive Attentional. When a point occurs with a verbalization that is not Direct Directive in nature, code the gesture separately if there is justification for separate utterances (e.g., no overlap or a pause). If separation cannot be justified, code the

verbalization for overall meaning. When a signed point (e.g. ear) occurs in isolation, it is coded as a Visual. However, if a signed point occurs in the context of a signed sentence, it is coded as Sign.

(b) Head nod: Visual is coded when head movement is used to communicate either "yes" or "no" to a partner. Other types of head nods are not coded because they are not considered to be communicative.

(c) Gestures: Visual is coded when movements of the hand or body are understood to be communicative. Gestures are generally widely understood and commonly known visuals, but also include less conventional visuals. Movements for any purpose other than communication (e.g., reaching to actually pick up an object) are not coded as Visual. Gestures are coded for Type according to their intended meaning. To facilitate the coding, give words to the subject's action. The following are examples of gestures:

Description: Pats floor/object
Translation: Indicates location/reference.

Description: Rubs head when partner falls on head
Translation: You hurt your head.

Description: Claps hands
Translation: Good.

Description: Extends hand toward other with palm held up
Translation: Hand it to me.

Description: Shrugs, arms spread, palms up
Translation: I don't know./Where is it?/What?

Description: Wags index finger back and forth
Translation: Don't do that.

Description: Places index finger pointed up over mouth (if not learning sign language)
Translation: Be quiet.

Description: Holds hand out, close to ground, with palm down (if not learning sign language)
Translation: It's short.

Description: Reaches out, object is out of range
Translation: I want that.

(d) Pantomime: Visual is coded when a partner plays out an event without the use of objects. If a person is pretending while using actual objects (for example, pretending to eat using the dishes or pretending to cook with the utensils), the behavior is not considered a pantomime. Do not code as pantomime an instance when a person has or pretends to have an appropriate behavioral response (ie. normal conventional response) to their partner's preceding behavior. For example, C hits M on knee with hammer and M jerks her knee in pretense of being hurt. Another example, M gives C

a shot & C grabs arm in pretense of being hurt. Another example, C puts spoon to M's mouth and M smacks her lips pretending to eat. An exception to this is when the behavior is done in such an exagerated manner that the person seems to be communicating. Some examples of what they might be attempting to communicate are "That really hurt," "I'm dying," "I'm eating this." Keep in mind, that for this kind of pantomime to be coded, it must be done in an over-exaggerated manner.

The following are examples of Pantomime:

Description: Thumbs through the pages of an imaginary book
Translation: Look through the pages.

Description: Drinks from a pretend cup.
Translation: Drinking.

Description: Gagging, coughing, & choking after taking a drink.
Translation: That drink was awful.

Description: Pours from imaginary pitcher into a real toy cup
Translation: Pour.

(e) Exaggerated Facial Expression: Visual is coded when a "larger than life" facial expression is used specifically to communicate something to the partner. Often, an emotion, such as fear or pain, is expressed. Such expressions are not only exaggerated facially but most are also sustained for a few seconds longer than normal. Natural smiles are not coded. Facial expressions that result solely from the formation of a word or sound are not coded as Visuals. The following are examples of exaggerated facial expressions:

Description: Raised eyebrows with eyes wide and mouth open
Translation: Wow.

Description: Raised eyebrows, scary face
Translation: I'm going to get you.

Description: Eyes wide, frightened expression
Translation: I'm really scared.

(f) Cued Speech is a supplemental communication method used with hearing impaired children where the phonetics of oral language are coded manually. To differentiate cued speech from other visuals, the coding sheet is marked with a "2" in the Visual dimension.

Sign

A Sign utterance is any communication incorporating some kind of sign language. Trained signers make transcripts of the signs used by M and C to allow nonsigners to distinguish between Signs and Visuals.

Attentional Device

An Attentional Device is a physical behavior used to gain a partner's attention. Such behaviors are usually translated as "pay attention" and are done solely for communicative purposes. Examples include touching the partner, waving hands or arms, and banging on the floor. Attentional Device can be coded if one touches the partner with an object, if the only reason the touch is made is for attentional purposes. Attentional Devices are not necessarily meant to be seen but to draw the partners attention through touch, sound, vibrations, or movements. When an Attentional Device is accompanied by additional communication, code the Attentional Device in the Mode dimension, and use the additional communication for coding the intent of the utterance. Attentional touches directed to the child are always coded as Child See under the Visual Attention dimension. This may not be true for other Attentional Devices, which are subject to the same rules as Visuals. That is, they must be seen by direct eye contact or through peripheral vision. Attentional Devices occurring in isolation are coded for TIMING according to the idea of the following/accompanying utterance or behavior. If there is no accompanying utterance, default to Responsive.

Physical

A Physical is any object-related behavior done for the sole purpose of communicating information to a partner. These actions either refer to an object or demonstrate how an object works. When a Physical occurs without accompanying communication, code it according to its intended meaning (i.e., put words to it). In most cases, object-related behavior is not coded because it is not primarily communicative. Be very conservative with the Physical category. The incidence needs to be very dramatic before it is coded. There should be a pause while the object is held up, and it has to be clear that the movement of the object was an integral part of the communication. For example, if M plays with toys or if M manually corrects C's mistakes, she is not coded as having been Physical. If an action with an object could possibly have any purpose other than or in addition to reference and demonstration, do not code it. The two types of Physicals coded are described below. With all physicals, be conservative.

(a) Object as Referent. An Object as Referent is seen whenever an object is moved for the sole purpose of referring to it. Such behavior is coded as Physical. If M or C holds up an object and makes additional movements as a way to draw attention to it (i,e., shakes it), Physical is coded. If a person moves an object for any purpose other than communicating reference, Physical is not coded. For example, M might say, "This is the next one," and then hand C a cup during the game of stacking cups. The purpose of M's movement would be to supply the next cup. The behavior therefore would not be coded because it is not for the sole purpose of referring to the object. Object as Referent is usually coded as Direct Direct Attentional in TYPE.

(b) Demonstrate. A Demonstrate is seen when an object is physically

manipulated to show a partner how it works. For example, if M says "It goes round and round" while simultaneously twirling a merry-go-round, the utterance would be coded for a Physical. If the subject is both demonstrating and correcting the partner, the behavior is not coded because it is not solely for demonstrative purposes. For example, if C stacks a cup incorrectly and M picks up the cup and says "This one is wrong. See, you have to turn it around." and then stacks the cup correctly, Physical is not coded. The main purpose of M's action is to correct the child, not demonstrate the correct way to stack the cups. However, if the subject demonstrates to the partner how an object works and then proceeds to let the partner "work" it, Physical is coded. If the subject abandons the demonstration before it has been completed, the behavior is not coded. Use the subject's intent to distinguish between pretend play and Demonstrate. Demonstrate is usually coded as Statement-General in TYPE.

Unclear or Hidden Nonverbal/Nonvocal Communication

If the nonverbal/nonvocal communication is totally hidden from the view of either camera, it is not coded. However, if the communication can be seen partially and can be understood in part, it is coded appropriately.

DIALOGUE CONNECTION

DIALOGUE CONNECTION classifies each utterance according to its sequential relationship within the conversation. There are five categories in this dimension: Spontaneous, Responsive, Reactive, Imitation and Repetition. Timing is coded for the dominant communication Mode, which is the Mode that carries the most information. The order of presidence for the Modes is as follows: Verbal & Sign (these two are equivalent), Visual, Attentional Device, Verbal Unintelligible, and Vocal.

Spontaneous

Spontaneous is coded when the utterance either begins a sequence of interactions or it is not a direct response to the partner's preceding communication. If the utterance changes the subject and/or the intent of the communication, it is coded as Spontaneous. For example, "Get the ball," followed by "Is that a bus?" suggests a change in activity and the second utterance is coded as Spontaneous. It is important to note that a Spontaneous utterance does not necessarily have to initiate a new topic. The Spontaneous code is used to indicate small or "micro" changes while the Topic dimension captures larger, more general changes in subject matter (see Topic). For example, "Get the ball," followed by "Bounce the ball," is a change in intent and only a small ("micro") change in topic so the second utterance is coded Spontaneous.

If an utterance suggests a new activity that the partner has not started, it is coded as Spontaneous. For example, if M says, "Bounce the ball," and C bounces it, and then M says "Kick the ball," the second utterance is coded as spontaneous because it suggests a new activity and was not directly responsive to C's behavior. If the partner does not join the activity right away, then there may be a string of Spontaneous utterances in a row, but once the partner joins the activity, then any conversation about that activity becomes Responsive to the activity, and

the partner's participation in it.

Spontaneous is coded when a subject is communicating about information not derived from the partner's social behavior or communication. For example, Spontaneous is coded if a person is communicating to her/himself or making a comment about her/his own behavior and is not responding to the partner in any way.

"Alright" and "okay" are only coded as spontaneous if there is no previous partner's behavior or verbalization that a person could be responding to and if the same person has the next utterance and that utterance is spontaneous. Otherwise, default to responsive if the meaning could be interpreted as "that's finished, lets go on.")

Responsive

Responsive is coded when an utterance functions as a reply to a partner's social behavior or communication. For example, if C hands M a toy and M says, "Thank you," M is responding to C's social behavior. If C reaches out to get a toy and M says, "Here you go," M is coded as being responsive to C. Any attempt to label the partner's behavior is Responsive. Notice that it is not necessary that the original social behavior be communicative before coding the partner as Responsive. Similarly, the behavior does not have to indicate a desire for a reply before the partner can be coded as responsive.

Examples of behavior to which one can respond even include such behaviors as compliance to a directive and looking for the referent (object) about which the partner is communicating. For example, M spontaneously says, "Get the ball.", C complies, and M is responsive by saying "Thank you". Also, if child is looking around for the object to which M is referring and then M says "It's right there.", M is responding to child's behavior (i.e. inability to locate the referent).

When a subject responds repeatedly to a single social behavior or communication, each utterance that is derived from the behavior/communication (i.e., relates to the behavior) is coded as Responsive. Also, a subject can be responsive to an utterance which does not directly preceed the reply but is close in time. For example, C says "I'd like to have a bunny." M responds "A bunny! That's a neat idea!" Then M follows up spontaneously with "Are you ready for lunch?" C responds with "Not yet," then M says "Where could we keep a bunny?" which is responsive to C's original statement about the bunny.

An utterance may contain new information, a new idea, or suggest an alternate toy or activity and still be coded as Responsive if it is in Response to the partner's communication or behavior. An utterance may be responsive to the on-going activity, even if it is not directly responsive to the partner. For example, if the activity revolves around cooking dinner, then any communication relating to the activity of cooking dinner would be responsive to the on-going activity, and therefore is in a sense responsive to the partner and the partner's involvement in the activity.

To differentiate between Spontaneous and Responsive categories within DIALOGUE CONNECTION, ask yourself if there is anything about the partner's

behavior or language that the subject could be responding to that suggests the following utterance. (Not just holding the object unless the following utterance is inherent in the object).

The following are examples of Responsive and Spontaneous communication:

Ex. 1: C> Would you get me that tablecloth?
M> Get one of those other ones over there. (Responsive)
C> You get it. (Responsive)

Ex. 2: (Child puts on the hat).
M> Model the way Mrs. Simpson showed you. (Responsive)

Ex. 3: (Child is walking little people around).
M> Let's put them in the bus. (Spontaneous).

Ex. 4: M> I wonder how high you can bounce that ball.
(a) C> This ball can go over the moon. (Responsive)

Ex. 5: (Child tries to go out of the room).
M> Come over here. (Responsive).

Ex. 6: C> What can we do now?
M> We could play with that wig. (Responsive).

Ex. 7: (Child makes a necklace and puts it on his/her neck).
M> You look like a horse in a show. (Responsive).

Ex. 8: (Child is putting together beads).
M> Make a necklace. (Spontaneous).

Ex. 9: (Child picks up tools).
M> You're a repairman. (Responsive).
(Child fixes car).
M> Fix the bike. (Responsive).
M> Clean your tools. (Spontaneous).

Ex. 10: C> I'm fixing the refrigerator.
M> Why don't we buy a new one? (Responsive).
M> Let's go shopping and buy one. (Spontaneous).

Some of the above utterances might be considered to have a spontaneous component to them (i.e. suggesting a new activity). However, if an utterance might be in response to the partner's communication or behavior, it is coded as Responsive.

Responsive is not coded when the partners have differing attentional/communicative focus. Utterances with both Responsive and Spontaneous components are coded as Responsive. That is, Responsive is the default category.

Reactive

Reactive is coded when a subject's utterance is intended to re-engage the partner in social behavior. Don't worry too much about the subject's intent, because Reactive is coded whenever the partner has been nonsocial, and the subject is the first to attempt to re-engage in social behavior. Before Reactive can be coded, however, the partner must be nonsocial for a minimum of three seconds prior to the subject's utterance. In instances of socially-directed activity, the partner is determined nonsocial when the activity has continued for six seconds (or longer if task requires) without accompanying or subsequent social behaviors. For example, if C looks at her/himself in the mirror for four seconds and M says, "Who's that in the mirror?", M is coded as Reactive to C. Similarly, if M and C are involved in social play with a bus, and C spends six seconds pushing the bus without any social behaviors during or following the activity, and M says "Is the bus going to school?" M is coded as Reactive. If an activity began as a social interaction, and the activity takes longer than six seconds to perform, then M may not be coded as Reactive when she communicates with C. This exception should be used with caution, however. It only applies when there is a clear end in sight. For example, if C tells M, "I'm going to cook dinner.", and then spends 26 seconds playing with the cooking toys without any social behaviors to M, C is being obsessive, since it doesn't have to take that long to cook the dinner. If C doesn't perform any social behavior, then, before M communicates with him/her, then M's communication is considered to be Reactive.

The subject's utterances continue to be coded Reactive until the partner is re-engaged in social behavior (i.e., the partner looks at or communicates with the subject). If C doesn't look at M until after M has already started the utterance, M may still be Reactive on that utterance.

If C is off screen, so that the coders can't be 100% certain that C has not performed a social behavior (e.g. visually 'checking in' with M), then default to C being social, unless there are a full six seconds of nonsocial behavior that the coders can observe.

Imitation

Imitation is coded when a subject mimics or copies the partner's utterance. To be coded as an Imitation, an utterance must occur in the same mode and must follow the original utterance closely in time without any intervening topics. Imitation can also be coded for partial reproductions of an utterance. For example, if C says "I call Dada" and M replies "Daddy.", M is coded as having imitated C. Imitation can be coded even if the word order is reversed, as long as the original meaning is preserved. For example, if M says "Hot Blanket" and C says "Blanket Hot", this is coded as Imitation.

Imitation is intended to reflect the influence of the partner's communicative act on the subject's choice of expression. However, when the same words are used by the partner as a matter of convention, these are not coded as Imitation. The following are examples of conventional responses : "Hi", "Bye", "Thank-you", "Okay", and "Your turn".

Imitation is not coded when there are changes in wording which alter the meaning of the original utterance or when new words are added to the

original utterance. For example, when C says "My daddy." and M responds with "Your daddy," M is not coded for Imitation. Similarly if C says "Red truck," and M says "That is a red truck," M is not coded for Imitation. Changing a noun to a pronoun does not alter the meaning and is therefore coded as Imitation. However, changing a pronoun to a noun does add additional meaning to an utterance by making it more specific and therefore cannot be coded as Imitation. Changing location, as from "There it is." to "Here it is" is not imitation. Nor is it imitation if the partner adds a word of agreement, as in the example: "I want cake.", "I want cake, too". Small word changes are okay if they don't add any new information. For example, changes from "A" the "the" or "the" to "A" are still coded as Imitation.

If a subject makes several utterances which are Imitations of a single utterance made by the partner, then the first utterance is coded as Imitation, and the rest are coded as Repetitions. If, on the other hand, the subject is responding to a second utterance by the partner, which is a Repetition for the partner, then the subject is making a new attempt to imitate the partner, and the utterance is coded as Imitation.

If an utterance is both Responsive and Imitative, Imitation takes precedence. For example, if M is Responsive by verbally correcting C, but Imitates her/his sign, code M's utterance as Imitation. If, on the other hand, one mode is Verbal, and the other is Visual, code the utterance based on the Verbal component. For example, if M imitates C's Visual, but is Responsive in her Verbal communication, code M's utterance as Responsive. Imitation can be coded even if the type changes. For example, if C says "Peanut butter cake," and M says "Peanut butter cake?", Imitation is coded even though the intent of the utterance has changed.

Imitation can be coded for Visual communication with the following restrictions: Don't code isolated headnods as Imitations, because copying a partner's headnod is a conventional response, and not true imitation. Don't code isolated points as Imitations, because it is not usually 100% certain that the referent is the same for both points. Facial expressions and gestures can be coded as Imitation, as long as they are similar to each other, and have the same meaning. If they mean the same thing, but are not similar to each other, then this is not imitation. For example, if M makes a "Yuck" face by sticking out her tongue, and C responds with a "Yuck" face that is a grimace, with no tongue stuck out, then this is not an Imitation. Pantamimes are not coded for Imitation if they are social routines. For example, if C pantamimes drinking from an imaginary cup, and then M drinks from an imaginary cup, then this is a social routine, and is not considered Imitation. On the other hand, if C pantamimes collecting eggs by pretending to pick them off of the farm poster, and then M does the same pantamime, this is NOT a social routine, and so this would be coded as Imitation.

Once imitation has been coded, a circle must be placed around the MODE of the Imitation. For example, if M said "See the ball" while pointing to the ball and then C states, "See the ball" without the point, C's Verbal would be circled. If however, C points and says "See the ball," then both Verbal and Visual would be circled.

Repetition

Repetition is coded when a subject either partially or exactly repeats his/her own previous utterance. An exact repetition must occur close in time to the original utterance (Three or less intervening utterances produced by either partner), with no intervening topics, to be coded as a Repetition. A partial repetition must directly follow the original utterance to be coded as a Repetition. (An intervening utterance by the partner does not effect a partial repetition.) For example, if M states "Get the ball." and then says "The ball," the second utterance is coded as a Repetition. An utterance containing any new information is not coded as a Repetition. Utterances produced by combining two or more previous utterances or by expanding a previous utterance are not coded as Repetitions. The only time that expansions are coded as repetitions is when a small word is added that doesn't change or add any meaning to the utterance (e.g. a, the, oh). Note: adding the partner's name to the utterance is not adding any substantive information, and so it is coded as Repetition. This is because it is assumed that all utterances within the dyad are directed to the partner, unless the dyad has introduced an "imaginary friend" into the conversation.

A repeated utterance must be referring to the same referent (e.g., behavior, object or idea) as the original utterance. If two utterances are referring to the same object but different pronouns are used, Repetition can still be coded. For example, if M says "Look at that" and then "Look at it," the second utterance is coded as a Repetition. However, if the second utterance becomes more specific (e.g., "Is that her dish?" to "Is that the baby's dish?"), it is not coded as a Repetition. If a subject comments on some new referent, using a previous utterance to do so, it is not coded as a Repetition. For example, if C is putting rings on a holder and M says "Good" after each ring, each utterance would be coded as a Response to C's social behavior and not as a Repetition. On the other hand, if the intent of the communicator is to repeat him/herself, perhaps to make him/herself clear, the referent is the same, and repetition is coded, even if the repetition is in response to a social behavior by the partner (e.g. M says "What color?", C responds "Red.", M repeats "What Color?", C repeats "Red". Both M's and C's second utterances are coded as Repetitions.)

If another Mode is added to an utterance, the utterance may or may not be coded as Repetition depending on the presedent level of the new Mode. (Remember that the higher level the presedent the clearer the intent and meaning.) (e.g., M signs 'baby' M then signs 'baby' and says "Get the baby.") In the example the second utterance has a different meaning from the first utterance despite the fact that the same sign occurs in both. A repeated utterance that is different in Type from the original utterance can still be coded as a repetition (e.g. "Night night." "Night night?"). Visuals are Repetitions if they mean the same thing and are similar in form. Note: Visuals that are maintained, not repeated, through more than one verbal (or vocal) utterance, are NOT coded as Repetition.

Once repetition has been coded, a circle must be placed around the MODE of the repetition. For example, if M said "See the ball" while pointing to the ball and then states "See the ball" without the point, only the Verbal would be circled. If, however, she both points and says "See the ball" on each utterance, then both Verbal and Visual would be circled.

PRAGMATIC TYPE

TYPE refers to the kinds of utterances the subjects make. Each utterance is classified into one of three TYPES: Directive, Question, and Statement. Each category of TYPE has several subcategories which help clarify and describe the language used. When coding TYPE, only the speaker's intent is important. Code according to the meaning behind a person's utterance. How the utterance was interpreted by the partner is irrelevant. What is most important is what the speaker intends to communicate. Each category and their subcategories are defined below.

Directive

A Directive is either a question or statement which is used to guide or manipulate the partner's behavior. There are two kinds of Directives: Direct Directives and Indirect Directives. The grammatical form of the utterance determines the type of Directive.

(a) Direct Directive General. A Direct Directive is coded when an utterance conveys the message that the partner is expected to comply. This is often accomplished through the use of verbal imperatives. Directives may be given prior to or during an activity. For example, if C is pushing the bus and M says "Push the bus," Direct Directive is coded. Examples of Direct Directives include "Come here", "Give me that", "Get the ball, please", "Let me have it", and "Say Hi!".

Isolated points are also coded as Direct Directives, except for isolated points to the self or the partner. This second type of point usually means "You/Yours" or "Me/Mine", and is coded as Statement General unless there is clear strong evidence that the subject is somehow being directive. An isolated point accompanied by a vocal is still classified as an isolated point. All Directive visuals done in isolation are coded Direct Directives rather than Indirect Directives. When a person states what is going to happen to their partner, such as "You're going to get a shot," this is coded as a Direct Directive if it requires their partner's cooperation. For example, "You're going to get a shot", usually means "cooperate while I give you a shot," and doesn't appear to give the partner an option. If the person says, "You need a shot," it is coded as an Indirect Directive, because the partner seems to have an option.

Attentional Direct Directives are differentiated from other Direct Directives. Attentional Direct Directives are coded when a partner in some way purposefully directs the other's attention. Generally, the word "look" is included in the utterance. Some examples of Attentional Direct Directives are "Look at this truck", "Johnny", and "Look." Attentional Devices (e.g., "pay attention" touches) are also coded here. When coding an Attentional Directive for Timing, use the idea of the accompanying or following communication or behavior. If there is no accompanying utterance or behavior, default to Responsive.

(b) Indirect Directive General. Indirect Directive is coded when a subject suggests an activity and looks for compliance to her/his request in the here and now. Indirect Directives can be either questions or statements. An Indirect Directive is differentiated from a Direct Directive in that the respondant has the option to say "No." without appearing disobediant. Examples include "May I see that?", "Will you give me the

rings?", "Let's play house." and "The telephone is ringing." When a subject says "Here" this is either an Indirect Directive General, meaning "Take this" or an Indirect Directive Attentional, meaning "Look at this" or "Pay attention". Use context to decide what the subject's intent is. To help distinguish Indirect Directives from Direct Directives, ask if the utterance could be phrased more directly. Keep in mind that the directness of an utterance can be influenced by the speaker's intonation.

When the purpose of the communication is to inform the partner what the other party wants to have happen, (e.g., "We're not having dinner any more,") then the communication is coded as an Indirect Directive. This includes such games as Hide-and-seek where one member of the dyad wants the other member to show where he is. However, if the person has already begun an activity, such as cooking, and her/his accompanying utterance is "Let me cook a cake", then the person is simply informing her/his partner what s/he is doing and the utterance is coded as Statement General.

Sometimes statements and questions seem to suggest an activity, when the speaker may not be looking for compliance. For example, if M asks C "Do you want to play with the dishes?", M may be suggesting an activity, or she may be making a genuine inquiry of C's preference. Similarly, if M says "There are some buttons on the stove.", she may be indirectly asking C to play with the buttons, or she may just be imparting information.

Use context to determine if an utterance is directive or not. If the subject is persistent in repeating an utterance, or seems to become insistent by following an utterance with several related utterances that suggest a particular activity, then s/he is probably being Indirect Directive. For example, if M says "There are buttons on the stove. If you push the buttons, the heat comes on over here. See? There are buttons you can push.", M is considered to be Directive, and all of the related utterances are coded as Indirect Directives. Usually, there must be several of such utterances to indicate that the subject is being directive. One exception is when a partner asks the other to suggest an activity. Then a single statement is enough to be considered a Directive (e.g. C> "What should we play with next?" M> "There's a ball.")

When an utterance that may or may not be directive is followed up by a clear Directive (either Indirect or Direct) it is coded as an Indirect Directive, as in the example, "The baby is crying. Get the baby". On the other hand, if the subject begins with a clear directive and then follows with a statement that provides a reason for the directive (e.g. "Don't hit the mirror. It'll break."), the follow-up statement is coded as Statement General, because the intent of the utterance is to explain the directive, and is not, in itself, a Directive.

Demonstrations are not considered to be directive unless they require the partner to perform the modeled behavior in the here and now. This is also true when the demonstration is done after the partner has performed the behavior incorrectly (e.g. "No. Like this." DEMONSTRATE).

Be conservative when coding Indirect Directives. If there is not enough evidence from the context, or from the wording of the utterance to consider it a directive, then default to either Information Real or

Statement General. This is also true for any instance in which both coders cannot agree on the Directive intent of an utterance.

Attentional Indirect Directives are coded separately from other Indirect Directives. Attentional Indirect Directives are noted when one partner directs the other's attention to something in an indirect or "softened" manner. The words "look" or "see" are often used in Attentional Indirect Directives. Examples include "See this Dolly?", "Johnny?", "Would you look at this toy?", and "See?". When coding an Attentional Directive for Timing, use the idea of the accompanying or following communication or behavior. If there is no accompanying utterance or behavior, default to Responsive.

When a subject makes any type of Directive and follows it with a "Yes", the "Yes" is considered a restatement of the directive, and is coded the same way in Type. However, this rule may be overridden for an indirect directive in which both coders agree that the "Yes" is clearly emphatic/insistent, thereby making it a Direct Directive.

Question

A Question is an interrogative expression. Questions are classified into one of three subcategories: Information-Real, Information-Constraint, or Rhetorical.

(a) Information-Real: An Information-Real question is coded when one partner asks the other for information he/she can't determine on his/ her own. Examples include "Are you hungry?" "How do you feel?" and "What did you say?" Questions asked during pretend play are usually coded as Information- Real Questions. For example, if M asks C "Who is that on the phone?" while C is playing with the phone, she is asking C for information she does not have and cannot get without C's reply. Questions asked for the purpose of clarifying the partner's earlier utterance are also coded as Information-Real. For example, if C says "I'm making a peanut butter cake", and M replies "A peanut butter cake?" M's question is coded as Information-Real because it's intent is to get clarification of C's utterance.

(b) Information-Constraint: An Information-constraint question is coded when a subject asks for information s/he obviously already knows. For example, when M asks "Who's that pretty girl in the mirror?" or "Is this a ball?", she obviously knows the answer but is using the question as a way to facilitate interaction with C. Information-Constraint is also coded when a partner asks the other to label a familiar object. For example, M may hold up a doll and say, "What is this?" in an attempt to get child to name the object.

If both coders are not totally certain that the person asking the question absolutely knows the answer, the question is coded as Information Real. For example, if C says "I talked to Daddy," and M asks, "Who did you talk to?", M may not be totally sure who C talked to on the phone, despite the child's comment, therefore M's question is coded as Information-Real. Similarly, if M asks C "Did you learn your numbers at school?", M may know C learned them last week, or may be asking if C learned them earlier that day, so M's question is coded as Information-Real.

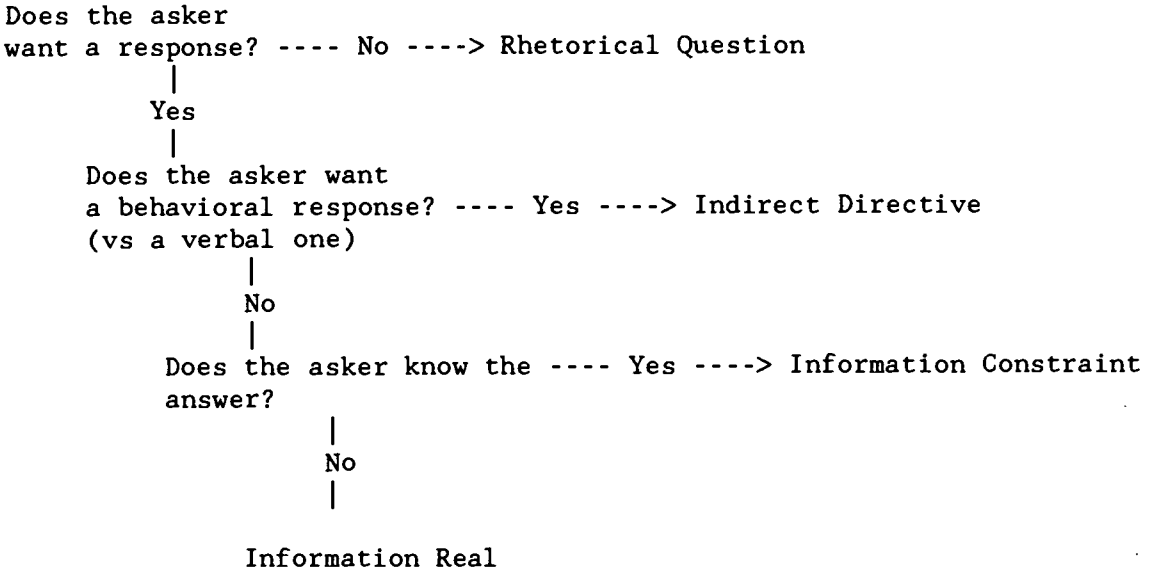
(d) Rhetorical: A Rhetorical question is coded when a subject makes a reflective comment in the form of a question. No attempt is made to "test" the partner, nor is s/he expected to answer. Rhetorical questions sometimes have "tag" words. Examples include "That's a nice ball, huh?", "This is fun, isn't it?", or "You have a lot of toys here, don't you?" When one member of the dyad is asking himself a question (e.g., "What do I want to eat?) then the coding is rhetorical.

Rhetorical questions can be differentiated using context and the speaker's non-verbal behavior. Accurate coding depends on an analysis of the person's paralinguistic behavior, (e.g., does s/he seem to expect an answer?, does s/he look at her/his partner and does s/he wait for an answer?). A question which is immediately followed with another utterance, leaving the partner no time to reply to the question, is coded as Rhetorical. This can happen when the subject answers his/her own question (e.g. "Do you know what it is?" It is a bus.") or simply continues to converse (e.g. "You don't want chicken? Wow, that's surprising").

Note: When a subject uses "Huh?" or "Hum?" as a separate follow-up utterance to his/her initial question, the utterance is generally considered to be a modified repeat of the question. Since no words from the original question were actually repeated, Repetition cannot be coded. However, the utterance is coded for the same TYPE category as the original question, unless the intent of the speaker has changed.

Use the following FLOW CHART to help determine the TYPE of question asked:

QUESTIONS



Statement

A Statement is a declarative sentence or phrase. There are four subcategories under this heading: Acknowledge-Positive, Acknowledge-Negative, Filler, and Statement General. If a statement does not meet the

criteria specified for the first three subcategories, it should be coded as a Statement-General.

(a) Acknowledge-Positive/Neutral: Acknowledge-Positive/Neutral is coded when one partner positively or neutrally evaluates, reinforces, or conveys acceptance of the partner or his/her behavior. This includes qualitative judgments shown through tonal inflections, words, or gestures. An Acknowledge-Positive/Neutral can be a reflective statement which recognizes the partner's behavior. These statements do not provide new semantic information. Examples: "Thank you", "Yes", "Uh-huh", "There you go", "Wow", "Good for you", "That's right", or clapping. Statements without a personal evaluative component are not coded as Acknowledge-Positive/Neutral. For example, statements like "You look happy", "This is fun", "That's a good toy", or "That looks pretty on you" are not coded as Acknowledge-Positive/Neutral. When a positive statement is made in which the subject of the statement is not specified (e.g. "oh good", or "how pretty!"), code the utterance as Acknowledge Positive/Neutral of the partner, unless it can be clearly determined by contextual information that the referent is not the partner.

If a partner says "uh-huh" in response to an Attentional, this could mean "You have my attention", which does not have an evaluative component to it. Therefore, these "uh-huh"s are coded as Statement Generals.

(b) Acknowledge-Negative: An Acknowledge-Negative is coded when a subject indicates that the partner did something wrong by negating or criticizing the partner or his/her actions. Acknowledge-Negative is not the opposite of Acknowledge-positive. Examples include "Nope", "Uhoh", "Whoops" or "That's a stupid thing to do." "No" is coded as an Acknowledge-Negative unless the speaker obviously intends to direct, question, or answer the partner. When an utterance is both an Acknowledge-Negative and a Directive, (i.e., "No, No!" meaning Stop that) it is coded as a Directive. Acknowledge-Negative is intended to capture a subject's negative evaluations of his/her partner. Therefore, statements with negative affect (sarcastic comments) but without an evaluative component of the partner are not coded as Acknowledge-Negative. Similarly, a negative statement that does not specify the subject (e.g. "Good Lord!") and can not be clearly determined to reference child or child's behavior from contextual information, is not coded as Acknowledge Negative.

When coding Acknowledge- Positive or Acknowledge Negative, base the decision on the true meaning of the utterance, which overrides the form of the statement. For example, "No" can mean "You are right, it is not", and "Yes, it is!" could mean, "You are wrong. It is so." Use the context of the conversation to determine the true meaning of the utterance.

(c) Filler/Totally Unclassifiable: A Filler is an isolated utterance used to hold the speaker's place in a conversation or to keep the recipient's attention. Sound effects are coded as Fillers, as are "Oh", "Ah" and "Um." If a filler is included in a larger utterance, the filler is ignored and the utterance is coded according to its overall type.

Unintelligible utterances are also coded as Filler/Totally Unclassifiable. Utterances which are only partially intelligible are coded as

Filler/Totally Unclassifiable if TYPE cannot be identified through context and intent. For example, in the utterance "XXX the ball", the verb is missing thereby making it impossible to determine the TYPE of communication. When there is enough contextual information available to be certain of the intent of the utterance, TYPE can be coded. Usually the verb needs to be intelligible, as in "Throw the XXX", where the verb clearly identifies the speaker's intent to give a Direct Directive.

If the intent of an utterance cannot be discerned for coding the TYPE and TOPIC dimensions, assume the utterance is Responsive, and Maintained Topic.

(d) Statement-General: A Statement-General is coded when the above criteria are not met. Examples include " This dolly is pretty.", "We will see daddy soon.", "That bus looks like the one you take to school." Reading from a book and singing are coded as a Statement-Generals. A Directive given to oneself is coded as Statement-General. Answers to the partner's questions are coded as Statement-General. When the intent of a Signed utterance is ambiguous, default to Statement-General. For example, C may Sign "Wait", and it may not be clear if s/he means "You wait.", "I'm waiting.", "Let's wait.", or "We have to wait". Since the intent is ambiguous, and any of the interpretations is as likely as any other, default to Statement-General.

Communication to Toy

Communication to Toy is coded when a subject is speaking to a toy or an imaginary person within the context of a social pretend play episode. This code is used in addition to the TYPE category which identifies the content of the utterance. The communication may be direct (i.e. child speaking to the toy) or through another toy (i.e., child pretending one toy is speaking to another). If a subject speaks to the partner or the partner's toy through another toy the utterance is considered to be directed to the partner, and Communication to Toy is not coded. As in any category, there will be grey areas where the coders are not sure if the communication is to the toy or to the partner. Be certain that a communication is to the toy before coding this category. The conservative approach is to consider these all communications to be to the partner unless there is sufficient evidence to consider them to be directed to the toy.

TOPIC

TOPIC refers to the number of different ideas introduced during the play session. A TOPIC is generally denoted by the subject of play. In the absence of play, the TOPIC is determined by the subject of conversation. When TOPIC changes occur, they must be on a "macro" level; one label describes the new TOPIC. For example, an utterance might be about the "doll" topic, the "train" topic, or the "let's stay here" topic. The TOPIC may be changed verbally or behaviorally. TOPIC is not a dyadic code; it captures changes in subject that each partner makes in their own communications.

New Topic

New Topic is coded every time M or C changes the subject. For

example, when C enters the play room and picks up the doll to play, C is beginning a New Topic. When M begins play with a tractor (which is not related to doll), she is starting a New Topic. A new topic can be initiated either verbally or behaviorally. The new topic actually begins the moment a member of the dyad either touches the object which will become the new focus, or communicates about the new object or focus. However, New Topic is coded only for the partner who is first to communicate about the topic. In this way, the member of the dyad introducing communication on the new topic is captured.

New topics are coded as Spontaneous utterances in DIALOGUE CONNECTION, unless there is behavioral lead-in to the new topic, to which the partner is responding. However, all Spontaneous utterances are not New Topics. The coding of DIALOGUE CONNECTION and TOPIC are independent; TOPIC captures the "macro" changes while DIALOGUE CONNECTION captures "micro" changes in the social communication. The introduction of a new toy does not always indicate a change to a New Topic. New toys can be incorporated into an on-going topic, thereby maintaining the established topic. On the other hand, changes from pretend play to exploratory play with the same toy will be coded as two separate topics. For example, if C is playing with the doll as a baby and then changes the focus to how the baby's/dolls clothes work, this is considered to be the start of a New Topic. Another example is when C is learning how to manipulate the thermometer and then switches to playing doctor. The communication can occur in any MODE.

If related objects are treated as separate objects and not merged, then they are coded as separate topics. Topics are merged a) when both objects are incorporated into the same activity even if one object follows the other object (e.g., hat & wig), b) when an utterance or utterances identify a broader topic (e.g., child says "we're making breakfast" - then cooking and eating are both part of the breakfast topic), c) when a new object is introducted into an existing activity (e.g. C is on cooking breakfast. M says " Is it time to wake up baby, so she can eat breakfast?). If toys are related and communication regarding them fits into a similar heading they shall be considered the same topic. Topics can be maintained as long as any shifts in topic are linked or flow together, even if there is no relation between the last utterance and the first. (e.g., cooking to setting the table to eating to washing the dishes to cleaning the kitchen to clean the rest of the house). If changes in action seem choppy and don't flow well together, ask if this might be the beginning of a New Topic.

If subtopics can be identified by a more generic topic, they are coded as a single topic. Following is a list of examples:

ex.1: syringe & thermometer get merged into doctor activity even though each was initially introduced separately.
ex.2: hat & wig, both tried on heads are merged into "things on heads topic."
ex.3: cooking and eating are merged into "meal" general topic.
ex.4: Kicking, rolling, throwing, bouncing ball are all considered "ball" topic.
ex.5: cooking and playing with the banana equal "food" topic.

Sometimes there is a lag time between topics, and some communication

may occur in which the dyad is trying to decide what the next topic should be. If this communication is brief, and the dyad quickly move onto a new topic, this lead-in communication is considered to be part of the new topic, and when the new topic's focus is identified, this utterance will be coded as "Maintained Topic." (e.g., M says "What should we play with next?" C says, "You're going to get a shot. Mom's utterance is coded as New Topic, and C's utterance as "Maintained.") If on the other hand, communication about what-to-do-next is extended, involving several utterances, this can be considered to be a topic in and of itself (the "What to do next" topic), and then when a new focus is decided upon, this, too, would receive a New Topic code.

Maintained Topic

Maintained Topic is coded for all of M's or C's utterances in which the subject remains the same. For example, when the dyad plays with the doll, all utterances on this subject are coded Maintained Topic except for the original utterance. Maintain Topic is the default for utterances in which the topic cannot be determined.

Note: The interaction that occurs before the beginning of the coding segment is always reviewed prior to coding to determine if the dyad starts on a New or Maintained Topic.

Occasionally, a dyad changes the subject briefly and returns to the original topic. These short deviations are Asides. Asides are not coded as New Topic; they are coded as Maintained Topic. Asides generally (not definately) range in length from 1 to 5 utterances. The dyad's focus, intensity, and the length of time that the dyad has deviated from the topic are considered in determining whether or not a deviation is an Aside. There is no specific rule for the number of utterances that define an Aside. One clue to use to decide if a deviation is an Aside is to observe whether one or both of the partners continues behaviors related to the original topic while communicating on the Aside.

When the partners appear to go from one "aside" to another, but do not return to the original topic before establishing a New Topic, then the first deviation in topic marks the end of the Maintained Topic. Each "aside" then becomes an individual topic and is coded accordingly.

TOPIC COHESION

TOPIC COHESION captures the congruence of the partners' play (i.e. whether M and C are engaged in play with the same topic or are on different topics). This is a dyadic code: the synchronicity of both M's and C's play is coded. The coding of TOPIC COHESION is dependent on the thorough understanding of TOPIC.

Joint/Same Topic

Joint Topic is coded whenever M and C are on the same TOPIC. For example, if both M and C are playing with the bus, they are coded Joint Topic. If both partners are manipulating different toys, but are communicating on the same topic, they are coded Joint Topic. Anytime that

M and C are attending to each other, they are Joint.

Different Topic

Different Topic is coded whenever M and C are not on the same TOPIC. For example, C may play with the cups while M manipulates the doll. If neither M nor C acknowledges the other's play communicatively or behaviorally (including looks longer than a fleeting glance), the dyad is coded as Different Topic.

Different is only coded when both of the following events co-occur: a) if M and C each have their own, separate topic (evidenced communicatively or behaviorally), and b) the receiver of the communication does not acknowledge the partner's topic through communication or behavior.

Sometimes a subject seems to be beginning a separate topic, but is not yet clearly focused on that topic. A subject is clearly focused on a topic if either of these things occur: a) s/he has communicated about the topic, or b) s/he has the new object in hand. If the subject is not clearly focused on a separate topic, then the dyad cannot be coded as being on Different Topics.

Note: During an aside, TOPIC COHESION is coded according to the mutual or nonmutual focus of the partners. For example, if C points to lights and M acknowledges the point, TOPIC COHESION is Joint. If M does not acknowledge the point and is on a separate topic, then TOPIC COHESION is Different.

VISUAL ATTENTION

Visual Attention is only coded for M's utterances. It is used to determine if C is receiving communication visually. Use your knowledge of the filming room and reflections in the mirrors to facilitate coding utterances. Hearing and deaf children are coded exactly the same regardless of a child's ability to hear M's communication.

Child See

Child See is coded if C can see M's communication. C only needs to see one word of the communication to be coded as Child See. If the communication is bimodal, C only needs to receive one Mode of communication to be coded Child See.

Oral-Only Communication:
If the communication is solely oral, then C must look at M's face to be coded as Child See. If child is looking at an object and M's face is behind the object and in child's frontal view, code as Child See. If you can see the angle of C's head, but not the eyes, and a glance at M would be unnatural or strained at that angle, code the utterance as Child Not See.

Visual Communication:
If it appears that C can see M's Visuals, Physicals, or Signs in frontal vision, peripheral vision, or in the mirror, Child See is coded.

Attentional Touches:
Child See is always coded for attentional touches. Other attentional

devices, such as waves and hitting the floor, are coded for Child See in the same manner that visual communication is coded.

Child Not See

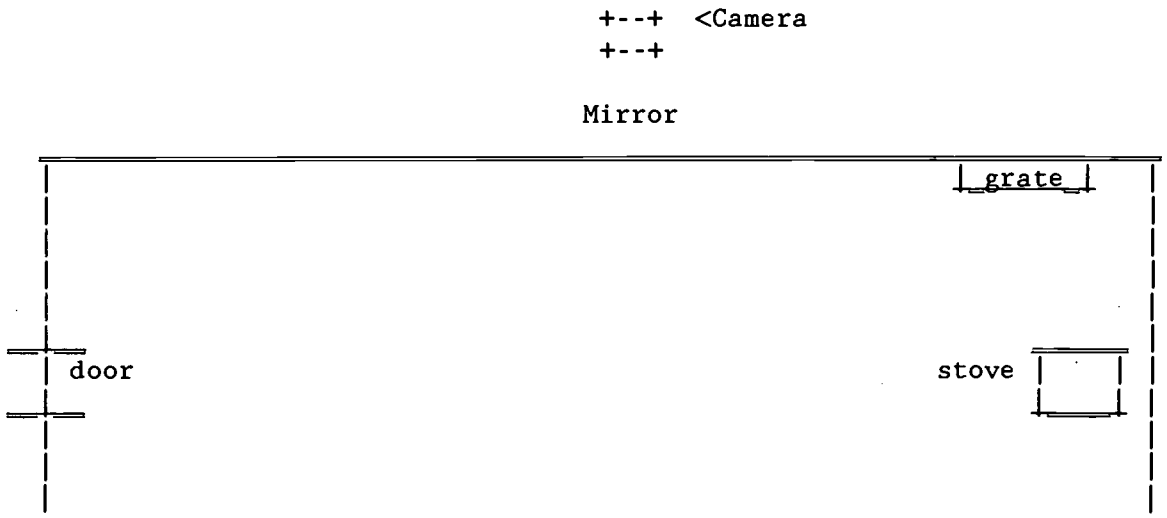
Child Not See is coded if C: a) is not looking at M's face during M's oral utterance or does not have M's face in frontal vision, b) could not see M's visual communication even in her peripheral vision. If the coders can see the angle of C's head, but cannot see the eyes, and a glance at M would be unnatural or strained at that angle, C is coded as Not See.

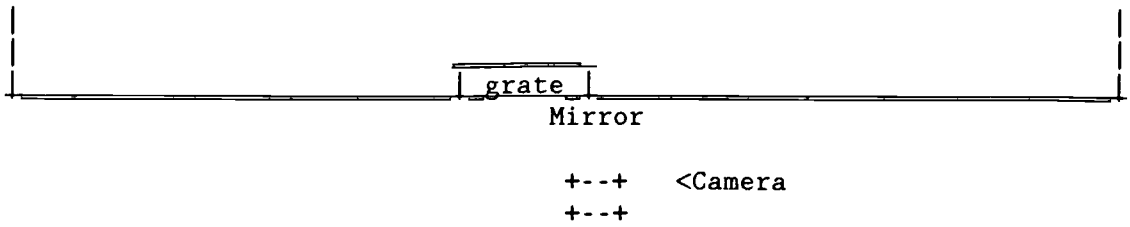
If C sees M's reflection in the mirror, but her communication is solely oral, Child Not See is coded. An exception to this is when both M and C are close to and facing the mirror and it appears that C has a good view of M's face in the mirror. In this case, Child See could be coded for M's oral communication.

Can't Tell

Can't Tell is coded when it is unclear if C can see M's communication. Some instances in which Can't Tell would be coded are: if either M or C is off the screen; if only the back of C's head is visible; it is unclear whether a Visual was in the child's peripheral vision; or if there is some interference which may block C's visual path. Can't tell is also coded when C sees only a small fragment of M's oral communication (e.g., the very beginning of a word or only the end of a word). If a Visual can only be seen by looking in the mirror, unless it is obvious that the partner saw it in the mirror, code as "Can't Tell".

Diagram of Filming Room




grate
Mirror
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<Camera

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

~~MODE~~
- VERBAL
- VOCAL
- VISUAL
- ATTENTIONAL DEVICE
- PHYSICAL
- SIGN

TIMING:
- SPONTANEOUS
- RESPONSIVE
- REACTIVE
- IMITATION
- REPETITION

TYPE:
- DIRECT DIRECT GENERAL ATTENTIONAL
- INDIRECT DIRECT GENERAL ATTENTIONAL

QUESTION
- INFO REAL
- INFO CONSTRAINT
- RHETORICAL
- TEACHING

STATEMENT
- STATEMENT GENERAL
- ACKNOW NEUT-POSITIVE
- ACKNOW NEGATIVE
- TEACHING
- FILLER/TOT UNCLASS.

COMMUNICATION W/TOY

TOPIC
- NEW
- MAINTAIN

SYNCHRONICITY
- JOINT/SAME
- DIFFERENT

VISUAL ATTENTION
- CHILD SEE
- CHILD NOT SEE
- CAN'T TELL

SUBJECT H 33 3 yr

CODERS MKM + KCL

TIME: 16:15 / 16 ...

DATE: 5-9-90

PAGE: 1

INTERACTION CODING MANUAL: MOTHER-CHILD INTERACTION

Amy R. Lederberg

SOCIAL BEHAVIOR

This is a code that analyzes only socially-directed behaviors. In other words, if a behavior is not directed to the other person in the dyad you ignore it. Therefore, one of the major tasks of the coder is to determine if a behavior is socially directed or not. You should be 95% sure that a behavior is directed at the partner in order to record it as social. Remember that you are trying to determine the actor's intentions not the recipient's interpretation of that behavior. Therefore, you should be trying to determine if the actor meant to direct his behavior to the partner, not if the recipient realized the behavior was social. Remember that socially directed behavior means just that -- that the person is directing the behavior to the partner. It is not sufficient for the person's behavior to be showing that s/he is aware of the partner, or interested in the other person. There are four general criteria that can be used in making this decision. Any one of these criteria is sufficient to mark a behavior is social.

1. A social behavior is usually accompanied by a look in the direction of the partner, either directly in the face, toward the back of his/her head, or in his/her direction. A look is usually simultaneous with the social behavior, however it may precede or follow the behavior if you are 95% confident that the behavior is social. If looking behavior is incompatiable with the social behavior (e.g., playing with a toy) then the behavior is usually bracketed (i.e., preceded and followed by the behavior) by looks if it is social.

There are times when a simultaneous look does not indicate that a behavior is social. The mother could be sitting looking at her child and moving a toy around without really directing that object-related behavior to her child. This is a good example when the mother's behavior is showing that he/she is aware of the partner, or is interested in her child but is not directing a social behavior at that partner.

2. A behavior is social if it is in response to the partner's command. In other words, if the mother tells her child to do something and the child does it then the behavior is social. The command can be direct (i.e., a verbal imperative) or indirect (i.e., putting a toy in front of the child's face). For example, if the mother says or indicates in some way to the child to play with the ball either by the direct command "Get the ball." or the indirect suggestion of throwing the ball and then looking at the child. If in either case, the child goes and gets the ball, then her behavior would be considered social, even if the child does not look at her mother. If the child (or mother) is already doing the action or is in the process of starting the action when the mother tells her to do the action then the action is not necessarily a social response. In other words, it is only when the action is done in response to the other's request does it become social.

3. Imitation of the partner is a social behavior. The behavior has to be clearly imitative, i.e., the person could not have been doing the behavior previously.

4. A new look is coded as a social behavior. This is when a person, in response to the other person's behavior or to an event in the environment, turns (frequently with a head jerk), and looks (or stares) at the other person, with the meaning of "what happened". This is counted as

a social behavior because it is clearly communicative. This is the only time just looking at the partner (i.e., looks without any other behaviors) can be counted as social.

Gestures, signs, and touches are almost always social. Verbalizations are usually social, except when someone is "speaking to oneself". Use looking behavior, topic, and intonation to distinguish self-directed speech from socially-directed speech. Vocalizations are frequently non-social. Usually only those vocalizations which are accompanied by a look are counted as social.

INIIATIONS

The first social behavior after a 5 second interval when there has been no socially directed behavior. Who is initiating, the time the initiation began and the time it ended all marked on the coding sheet.

INTERACTION

A sequence of social behaviors of at least 2 turns. An interaction is terminated after a 5 second interval when there has been no social behavior. Topic is irrelevant. The time the interaction ended is marked on the coding sheet. This is the time when the last socially directed behavior ended. See object-related behavior below for determining the time of the end of such behavior.

TIMING

Five seconds of "dead space" (i.e., with no social behaviors) terminates an interaction or an initiation. Any socially directed behavior following the 5 seconds is considered an intiation and the start of a new interaction. This is true whether the initiation follows (with a 5 second interval or more) the person's own socially directed behavior or his/her partner's behavior. A person can continue his or her turn for an indefinite amount of time if there is not a 5 second interval when there is no social behavior.

If the time in between two social behaviors is between 5 and 6 seconds, be conservative and break the interaction (i. e., go with the 6 seconds).

TERMINATIONS.

The person who fails to respond to his or her partner's social behavior is the terminator of the interaction. (That is, if person A did the last social behavior in an interaction, then person B is the terminator.) This is coded on the coding sheet.

In addition, there are two different types of terminations coded: Not received (N) which is coded when the social behavior was most likely not even received by the partner. For instance, gesture or verbalization to the back of a deaf child. If visual communication is used when the other person can probably at least perceive it in peripheral vision then don't count it as not received. You should be coding the whole last turn of an interaction, so if any of the turn was probably received then don't code it

as not received. No response (R): is coded for all other types of terminations. The N and R are placed in the termination column.

UNSUCESSFUL INITIATIONS

These are initiations that do not get a response within 5 seconds. Unsuccessful initiations get coded as such by marking the no response column on the coding sheet with the reason why the partner did not respond (i.e., Not received or no response).

OBJECT-RELATED BEHAVIOR

Timing of socially-directed object-related behavior is a little different from other behaviors because it is most likely to start socially and then become nonsocial. Here are some guidelines:

(1) an object-related behavior that has been determined to be social (either because it is in response to a command, an imitation, etc.) and NOT accompanied by other social behaviors (e.g., a look), then it can only carry the interaction for only 5 seconds, or as long as it lasts, which ever is shorter. Here are some examples: a) Mother tells child to put the cups together and child starts to do this at 3:50. Child keeps playing with the cups until 4:00. Child does not look at mother during this whole 10 seconds, nor do either do any other social behaviors. The playing with the cups would be considered social because it is a response to a command. However, you would only mark 5 seconds of it as social since no other behavior occurred. Thus, the interaction would be seen as terminating at 3:55. If playing with the cups was an imitative response then the same would apply. b) If the child played with the cups for 3 seconds and then no other social behaviors occurred then the interaction would terminate at 3:53.

(2) A socially-directed object-related behavior, unaccompanied by looks or other social behaviors, can still carry the interaction for more than 5 seconds if it takes longer to carry out and is followed by another social behavior or a look at the partner. For example, if mother gives the child a bead to put on another bead and the child takes 7 seconds to do it and then looks up at mother, or child does another social behavior the interaction would be coded as continuing. If child does not do anything social at the end of the putting the bead on then the interaction would be coded as terminated after 5 seconds.

(3) If an object-related behavior is accompanied by looks or other social behaviors and is clearly social throughout then continute the turn until it is terminated. Example: If child is playing with dolls and looks up at mother throughout the play then the doll play is considered social throughout.

(4) A socially-directed object-related behavior is not always counted as social for 5 seconds. An object-related behavior can be coded as social because it is accompanied by look etc., and then become clearly non-social. In this instances, stop carrying the interaction from the point the object-related behavior stopped being social.

Tape D16 Start 9:19:12 Stop 9:34:12 RATER KS, KW

INITIATIONS						INTERACTION			TERMINATION	
Mother			Child			No	End	Total	By	By
Start	Stop	Total	Start	Stop	Total	Response	Time	Time	Mother	Child
9:19:12		Camera					19:29	17		N
19:42	19:53	11					20:36	54		N
20:47	20:53	~~4~~ 6					21:17	30	N	
21:24	21:24	1				N				
21:30	21:40	10					22:10	40		N
22:27	22:31	4					22:42	15 ~~25~~		N
22:57	23:09	12					23:16	19		N
23:26	23:26	1				N				
23:34	23:43	9					23:43	9	N	
23:52	23:56	4				N				
24:07	24:10	3					24:10	3	N	
24:20	24:24	4					24:44	24	N	
24:50	24:51	1					26:39	1:49	N	
26:48	26:52	4					26:56	8		N
27:03	27:12	9					27:37	34		N
27:51	27:58	7					28:57	1:06		N
			29:12	29:13	1		30:01	49	N	
30:12	30:18	6					31:18	1:06		N
31:27	31:29	2				N				
31:37	31:41	4					34:12	2:35	Cut	
#I+T	19	1:39 ~~1:44~~	# Succ	# Unsucc						
m	18	1:38	14	6						
c	1	:01	1	0						
#I+T	15	11:38 ~~11:42~~				600 38				
Term	9	C	0							
m	10	C	6							
c	9	C	9							
Total		1:43			:01			11:42		

1:38   11:38

BEST COPY AVAILABLE

TAPE ________ Start ________ Stop ________ DATE ________

INITIATIONS						INTERACTION			TERMINATION	
Mother			Child			No	End	Total	By	By
Start	Stop	Total	Start	Stop	Total	Response	Time	Time	Mother	Child
Total								15:00		

Quality of Mother-Child Interaction

Amy R. Lederberg, Kathy Frankel, & Madge Willis
Summer 1990

These scales were adapted for use with hearing mothers and their deaf and hearing toddlers. The scales are based on ones created by Crawley and Spiker, and Schlesinger and Meadow (1972).

MOTHER RATING SCALES

***in any category Mother does not have to do everything under a particular rating number in order to score that number, but needs to do at least one of the things listed there

1. Directiveness: a measurement of the frequency and intensity with which Mother guides Child's behavior, allowing Child to be dependent/independent. Directives are verbal, gestural or physical manipulation in nature, and "ask" for an action/behavior from Child. High intensity directives are insistent and demand compliance; they are dictatorial, commanding, and may be prohibitive. Low intensity directives subtly guide/lead Child's behavior through questions, declaratives, physical guidance, or attention getting behavior; may be mutual in focus by allowing Child to refuse without seeming disobedient; do not demand compliance. Use Mother's inflection as a clue for the intensity of a directive; forcefulness and tone can over ride the form of the directive. Directiveness should not be confused with intrusiveness. Look for intention and purpose and how much control the mother is trying to exert or discourage independent actions.

1. Mother may allow Child complete independence in performing activities or occasionally suggest particular activities. Mother uses low intensity directives and directs Child no more than 10% of time. She primarily watches, comments, and elaborates. Never persistent.

2. Mother spends much of the time watching and commenting but uses low intensity directives, directing Child 11-30% of the time. There should never be more than two high intensity, persistent directive episodes.

3. Mothers spend between 31-50% of the time directing. Mother uses a mixture of high and low intensity, but mostly low.

4. Mother uses a mixture of low and high intensity directives, directing Child more than half the time.

5. Mother directs the child more than 50% of the time, using alot of high intensity directives; she is more persistent, more repetitious, and more demanding of correct response.

*"attention getting behavior" = indirect directives, i.e. "the phone is ringing." - intent is to focus Child's attention on the phone.

Control Techniques reflect Mother's style of directing Child by discerning the type of directives.

1a. Communicative Control Techniques: verbal and nonverbal (i.e., gestures) directives.

1. Mother uses mostly low intensity directives in her communication (less than half). This includes head nods, points, smiles/frowns, and facial expressions as well as verbalizations. She can use some high intensity but it is less than half.

2. Mother uses low and high intensity directives in her communication to about an equal degree. She does not lean heavily in either direction. High intensity from 50-74%.

3. Mother uses more than 75% high intensity verbal and nonverbal directives, which are dictatorial and commanding, including negative and prohibitive statements.

1b. : Object and Person Manipulation Control Techniques: physical manipulations of objects or Child to direct Child's behavior. (i.e. forcefully removes toy from Child's hand, or physically moving Child through the motions of a task).

1. Mother uses only intensity directives, physically manipulating the environment/objects as a way of subtly guiding Child's behavior (i.e., mother begins playing with new toy to encourage Child's play with that toy).

2. Mother physically manipulates the child 1-2 times.

3. Mother uses mostly high intensity directives more that two times, physically manipulating Child to guide behavior

2. Didactiveness: the degree to which Mother's interactions with the child is used to teach, impart information, or get the child to "perform" or give back information that the mother already knows. The didactic mom seems most interested in developing the child's cognitive/language/intelligence skills. The "opposite" is the degree to which the mother's behavior is done to get involved in a play activity. High level didactic behaviors include demonstrating proper techniques, giving feedback and wanting Child to show mastery. Some examples include getting Child to use a toy in a very precise manner, correcting mistakes, or drilling colors. Low level didactic behaviors include counting, labeling colors, emphasizing the name of things, how to pronounce/sign a word etc. without expecting Child to respond. Frequently the didactic mom shows approval of the child when s/he gives a "correct" performance.

Play does not have to be fun, Ask yourself what was the mother's motivation in doing something or saying something, was it to impart information,OR was it to get involved, or elaborate, or initiate some type of play activity, or neither.

1. Mother plays and teaches less than 40% of the time.

2. Mother almost exclusively plays. At most one occasion of low level didactic didactic behavior.

3. Mother has a teaching type of interaction less than 40% of the time.

4. Mother mixes teaching and playful style about equally.

5. Mother uses teaching style more than 60% of the time.

6. Most (80%) of mother's behavior seems to be more didactic than layful.

3. Stimulation Value: a measurement of Mother's use of toys and play activities (i.e. games) that are creative and cognitively stimulating for Child. A stimulating activity would be one that encourages Child to think or is a new behavior for Child. This measure includes inventiveness of games and use of toys; using a toy creatively, in ways other than what it was specifically designed for. Stimulation value of play should be judged according to its challenge to the child. The play should be appropriate for helping the child move to the next level.

1. Mother's interactions with Child are of little or no stimulation value (no more than 10%).

2. Mother's input is of minimal stimulation value. (11-39%)

3. Mother interacts with Child in a stimulating manner about half the time. (40-60%)

4. Mother interacts with Child is very stimulating but some of the time seems boring or repetitive. Or mother is very creative once or twice.

5. Mother's interactions seem to provide optimal stimulation value for Child. Most or all of the time Mother creatively stimulates Child to play with a toy to enhance cognitive development.Or mother is very creative three or more times.

*code only activities Child sees - if seen but not imitated/done, still count

4. Sensitivity: a measure of Mother's behavior showing that she is in tune with Child and aware of his/her cues or signals. When she initiates to Child she shows awareness of Child's current activity, developmental capabilities, and affective state. Mother modifies her behavior to adjust to Child's needs or interests. This code is a global rating of Pacing, Intrusiveness and Developmental Appropriateness. Insensitivities can include **not** scaffolding the child's play when the child needs it. Being rude to the child, e.g., turning back to him/her.

1. Mother may occasionally acknowledge Child's leads and pick up on Child's signals (11-30%), but only briefly. She frequently initiates without considering Child's activity or capabilities.

2. Mother's initiations, responses, and activities are sensitive and appropriate 30-50% of the time, but Mother still ignores Child or behaves insensitively on occasions and/or mild 5-6, 2 major).

3. Mother is sensitive more than half the time, and/or 3-4 times shows mild insensitivities and/or 1 time major insensitivity.

4. Mother is sensitive and responsive most of the time (more than 80% of the time); Once or twice shows mild insensitivity.

5. Mother is very sensitive to picking up on Child's cues, responding appropriately to her child's initiations, orienting her child before directing, and allowing the child to complete his/her activities. NO insensitivities.

Score lower number if either criteria is met.

5. Intrusiveness: the degree to which Mother's directive and/or elaborative behaviors interfere or interrupts Child's ongoing activities (i.e., does it require child to stop, turn around, or move). This includes abruptness and inappropriateness of Mother's actions, as well as Mother being in Child's physical space without permission form Child. Forceful interruptions are moving Child away from current activity or pulling toys away from Child or persists in insisting in the interruptions. Milder interferences include placing new objects in front of Child before he/she is finished with the previous one and interrupting him/her.

Use scale first, but if inconsistent with other mothers, go with gut rather than scale.

1. Mother interrupts and/or interferes with Child's ongoing activity six or more times, or two forceful interruptions.

2. Mother interrupts Child's activities four to five times or one forceful interruptions and a few may be milder interferences.

3. Mother interrupts Child's activities two to three times, no forceful interruptions.

4. Mother interrupts Child's activities one time, with no forceful interruptions.

5. Mother never abruptly interrupts or interferes. She may use directive techniques subtly, encouraging Child to voluntarily participate in a new activity.

*attentional touches are not considered intrusive for deaf children unless done in an insensitive manner

*not every interruption is intrusive - if it is done skillfully

6. Pacing: a frequency count of the rate with which Mother changes activities, makes verbal requests, comments, or elaborations on Child's play, while taking into account Child's demonstrated ability to keep up with Mother. Pacing is not simply a lack of mutuality, but reflects Mother's inappropriate timing (i.e., giving multiple directives in succession without considering Child's inability to follow is too fast in pacing; persisting with an activity when Child is bored with it is too slow in pacing). Pacing does NOT include apathy to play or failure to introduce new topics. Appropriate pacing is when Mother is patient and intervenes when Child pauses in activities rather than while the activity is ongoing.

The rate that mother changes activities when she is engaged is the primary aspect of the interaction that is being coded. Bad pacing is when she is too fast that the child can't keep up or too slow so the child is obviously bored and wants to move on but mother continues. Non activity is only coded as bad pacing if child is obviously bored, whining, and needs some structure from Mom who is not providing it.

1. Mother uses inappropriate pacing more than 5 times. She is frequently impatient and introduces new activities before Child is finished with old activities. Child cannot keep up with Mother's demands or mother is too slow for child and child becomes bored.

2. Mother uses inappropriate pacing of the between 4-5 of time.

3. Mother uses appropriate pacing all of the time except two -three episodes of inappropriate pacing.

4. Mother uses appropriate pacing all of the time except one episode of inappropriate pacing.

5. Mother uses appropriate pacing throughout the interaction, allowing Child sufficient time to perform activities without imposing new directives (100% appropriate pacing).

7. Developmental Appropriateness of Play: the degree to which Mother's directives and elaborations are appropriate to Child's cognitive and motoric level of development. Developmental appropriateness is defined by Child's abilities; an activity may be way above Child's developmental level such that Child consistently experiences difficulty in performing the activity, or an activity may be way below Child's developmental level so that Child gains no stimulation from the activity. For example, Mother may require Child to engage in elaborative pretend play when Child shows no evidence of pretend capabilities, or may require a non-verbal child to label an object. Failure to provide stimulating activity does NOT effect Developmental Appropriateness. You should be able to write down what was developmentally inappropriate.

1. Mother's activities are developmentally inappropriate on at least 4 occasions.

2. Mother's activities are developmentally inappropriate on at least 3 occasions, or on only 2 occasions when the activity is very inappropriate and Mother persists in trying to get Child to perform.

3. Mother's activities are developmentally inappropriate on at least 2 occasions, or on only 1 occasion when the activity is very inappropriate and Mother persists in trying to get Child to perform.

4. Mother's activities are developmentally inappropriate on at least 1 occasion.

5. All of Mother's activities are developmentally appropriate, that is, at or slightly above Child's level.

*make note on the code sheet if M is too LOW in developmental appropriateness

*use of language with a hearing impaired child is NOT considered developmentally inappropriate UNLESS Mother expects understanding of a verbal game which is structurally based upon understanding the verbal content. Use Child's general verbal abilities to judge the appropriateness of such a game for a particular child.

8. Positive Affect/Mood: the over all degree to which Mother directs positive feelings toward Child. This includes acceptance of and comfort with Child shown through warm/expressive voice tones, smiles, laughter, physical affection (i.e., hugs, pats), and verbal expressions of affection. Contingent approvals (positive reinforcements) are not necessarily positive affect.

1. Mother may use positive expressions only occasionally; she has a flat, bland expression and may seem detached.

2. Mother uses a mixture of neutral and positive expression (less than 75% of mixture is positive and all low level). Mother's voice is warm and she may smile several times.

3. Mother expresses positive affect most of the time, but in a "low level" manner, e.g., voice or facial expression.

4. Mother is generally positive, enthusiastic, and accepting. She has a very warm voice, smiles and laughs frequently.

5. Mother uses very expressive voice and a lot of enthusiasm. She is playful, smiles, laughs, jokes, and may be physically affectionate.

9. Negative Affect/Mood: the frequency that Mother negatively evaluates Child or Child's behavior through verbal disapproval or inappropriate negative affect. This includes teasing, rough and tumble play that has hostile undertones, cold or clipped voice, rejection of Child's play, sarcasm, and negative gestures (i.e., frowning, rolling eyes, making faces). Inappropriate negative affect is the use of negative or prohibitive comments and/or extreme intensity/harshness that are not called for within a particular situation; use context and tone to judge appropriateness of comments and intensity.

1. Mother never expresses negative affect.

2. Mother expresses negative affect once or twice.

3. Mother expresses negative affect two to three times, or once when it is intense disapproval of Child.

4. Mother expresses negative affect four to five times, or twice when it is intense disapproval of Child.

5. Mother expresses negative affect six to seven times, three times when it is intense disapproval of Child, or she may have an overall undertone of negative affect toward Child.

*this scale is not equivalent to the positive affect scale - there are overall more positives in communication, so the negative scale must be stricter to show the presences of negatives

*statements with mild or questionable negative affect and negative wording (i.e. "...while you terrorize the room") are coded for mild negative affect. If questionable but without negative words or clear negative affect, don't code.

10. Contingent Approval: the frequency and intensity of Mother's appropriate positive reinforcement of Child's behaviors. This includes smiling, clapping, verbal feedback (i.e., Thank you., That's good.), and positive physical expressions such as head nods. This category differs from Positive Affect in that this reflects reinforcements that are in response to specific behaviors by Child, NOT the overall degree of Mother's positive nature.

One intense equals two mild.

1. Mother gives 0-1 appropriate positive reinforcement.

2. Mother gives appropriate positive reinforcement on two to four separate occasions; reinforcement tends to be mild (smiling, low intensity verbal expressions, pat on the back).

3. Mother uses positive reinforcement five on ten separate occasions, most of which are mild, but may be intense on one or two occasions.

4. Mother positively reinforces most of Child's behaviors, some with high intensity (clapping, strong verbal expressiveness, hugs).

5. Mother positively reinforces most of Child's behaviors, about 75% of which is high intensity.

*count one contingent approval for all positive responses concerning a specific Child behavior - do NOT count each statement separately.

111 Communicative Competence: the degree to which Mother and Child display mutual and reciprocal understanding of each other's requests, observations, questions, and demands. This includes communication through speech, vocalizations, gestures, sign language, and facial expressions. This is NOT simply a measure of how much the dyad talk, but a measure of the amount of understanding and the level of complexity of the dyad's communication. The dyad's ease of understanding is also considered. For example, a dyad that has difficulty with mutual understanding yet works at attaining it (i.e., asks partner to repeat, asks questions to clarify), rates higher in competence than a dyad that makes no attempt to gain understanding and slightly lower in competence than a dyad that has initial understanding. A lack of mutuality is indicative of low communicative competence. Similarly, ignoring a partner is treated as not understanding the communication if you can't figure out if they understand the communication.

Complexity: is any communicative interaction (both mother and child have to show clear understanding/or communication) where the referent is not

present and is not evident in context/or part of a routine. For example, references to the past, future, or something not present in the room.

1. Partners have partial understanding (up to 50%).

2. Partners have 50-75% understanding.

3. Partners have 76-89% understanding.

4. Partners understand each other 90% of the time and have no complexities, or less than 90% but show understanding of complexities.

5. Partners have seem to understand everything thats communicated to each other (at least eventually), including the use and understanding of complex references.

*any routine type of play is not complex (i.e. routine on phone not used for abstract reference) - a communication needs to be new, spontaneous

Child Rating Scale

1. SOCIAL INITIATIVE: Any social behavior involving mother, any attempt to involve mother. These behaviors usually include looking at the mother without the mother initiating the interaction and can also involve vocalizing, talking, signing, pointing, offering mother an object without prior prompting, or pulling on mother to get her attention. MUST BE CHILD INITIATED. (Count each time the child brings in a new script).

1. FEW BRIEF ATTEMPTS - Little or no initiation by the child to involve mother, but may make some BRIEF ATTEMPTS, such as looking, pointing, vocalizing or offering mother an object.

2. SEVERAL BRIEF, FEW EXTENDED - Child initiates several BRIEF ATTEMPTS using social behaviors. One or two initiations may be extended.

3. SEVERAL EXTENDED, FEW BRIEF - Child initiates about 40% of the time with a few brief but most EXTENDED ATTEMPTS. Use of several social behaviors.

4. ALL EXTENDED - Child initiates about 50% of the time and is PERSISTENT with initiations.

5. ALL EXTENDED - Child initiates more than half the time, and behaviors may be INTENSE.

2. SOCIAL RESPONSIVITY/COMPLIANCE : Degree to which the child responds to mother's initiations. Involves frequency, quality and latency of compliant and non-compliant responses WITHIN THE EPISODE OF INTERACTION. Ignoring is a non-compliant behavior.

1. FEW RESPONSES, ALL NON-COMPLIANT - Child responds less than 25% of the session. When the child does respond, he/she is non-compliant. Most of the time child ignores mother's initiations.

2. SOME RESPONSES, MOST NON-COMPLIANT - Child responds less than half of the time with MOSTLY NON-COMPLIANT responses, COMPLIANT RESPONSES DUE TO PERSISTENCE on the part of the mother, and are LATENT.

3. RESPONSES, MOST COMPLIANT - Child responds more than half of the time with compliant responses, but may occasionally ignore or be non-compliant. SOME LATENCY.

4. MANY RESPONSES, MOST COMPLIANT - Child responds most of the time but may be LATENT in some responses. LITTLE LATENCY

5. MANY RESPONSES, ALL COMPLIANT - Child responds all the time quickly and enthusiastically. NO LATENCY.

3. OBJECT ACTIVITY INITIATIVE : Measuring the child's inclination to be independent in exploring environment. Involves observing the child's object initiation or object-related initiation behaviors, INDEPENDENT OF MATERNAL PROMPTING. Also involves how much time the child manipulates an object after the mother may have pointed it out - the key issue is the amount of exploratory behaviors on objects that are not prompted by the mother.

1. 0 - 3 INDEPENDENT OBJECT ACTIONS - Child follows mother most of the time, if there is object-related behavior, it is very unenthusiastic.

2. OCCASSIONAL INDEPENDENT OBJECT ACTIONS - Child initiates sometimes, but primarily in response to mother's directives.

3. 50% INDEPENDENT OBJECT ACTIONS - Child initiates 50% of the time, and follows 50% of the time. Seeks new toys or puts old ones to different uses.

4. MOSTLY INDEPENDENT OBJECT ACTIONS - Child initiates most of his/her object-related play, but still responds to mother.

5. MOST INDEPENDENT OBJECT ACTIONS - Child's object-related behaviors are independent of the mother's prompting.

4. AFFECTIVE SHARING : A qualitative global measure of the child's enthusiasm and enjoyment of the interaction with the mother.

1. OCCASSIONAL, TEPID - Child occassionally looks or smiles at mother, but shares NO EXTENDED INTERACTIONS.

2. SEVERAL SHORT OR FEW LONG, TEPID - Child has several short or one or two long interactions, affect is low.

3. MANY SHORT, OR SOME SHORT/SOME EXTENDED, TEPID/WARM

4. MOST EXTENDED, WARM - Active participation, some enthusiasm.

5. EXTENDED, VERY WARM - Active participation, high enthusiasm.

5. EXPRESSED NEGATIVE AFFECT: Negative feelings expressed during interaction with mother. (Crying when hurt is not negative).

1. NO NEGATIVE AFFECT

2. WHINE, FUSS 1-3 TIMES

3. WHINE, FUSS 4-6 TIMES / SCREAM, CRY, NEG. GESTURES 1-2 TIMES

4. WHINE, FUSS FREQUENTLY / SCREAM, CRY, ETC, 2-5 TIMES

5. WHINE, FUSS, SCREAM, CRY THROUGHOUT INTERACTION

6. MISBEHAVIOR: Dangerous or destructive behavior and/or behavior mother directs the child not to continue.

0. NONE

1. 1-3, CHILD STOPS IMMEDIATELY

2. 2-4, ONE OR TWO OF WHICH CHILD CONTINUES AFTER REPRIMAND

3. 4 OR MORE, SOME OF WHICH CHILD CONTINUES AFTER REPRIMAND

4. FREQUENT MISBEHAVIORS, MOST OF WHICH CHILD CONTINUES AFTER REPRIMAND.

5. CONSISTENT MISBEHAVIORS, USUALLY DOES NOT FOLLOW REPRIMAND

7. CREATIVE/IMAGINATIVE : Measure of child's creative constructiveness and inventiveness during play activities WITHOUT MOTHER'S PROMPTING. Includes using a variety of toys imaginatively and pretend play or fantasy play.

1. UNIMAGINATIVE, FEW TOYS

2. BORDERLINE IMAGINATIVE, VARIETY OF TOYS

3. SEVERAL SHORT OR 1-2 EXTENDED PERIODS OF PLAY

4. HALF THE SESSION IS EXTENDED PERIODS OF FANTASY/PRETEND PLAY

5. MORE THAN HALF IS EXTENDED PERIODS OF FANTASY/PRETEND PLAY

8. ATTENTION SPAN/DISTRACTIBILITY: Measures the child's attention to and persistence in mastery and completion of toy tasks, whether successful or not. Involves frequency of distraction with ease of returning to task after being distracted.

1. FLITTING AROUND

2. MASTERY OF SEVERAL TOYS, TASKS BUT EASILY DISTRACTED, DOES NOT RETURN TO TOY IF DISTRACTED.

3. MASTERY OF TASKS,TOYS, EASILY INTERRUPTED, AND MOVES TO ANOTHER TOY

4. MASTERY OF TASKS,TOYS, MAY BE INTERRUPTED, BUT RETURNS TO SAME TASK

5. MASTERY OF TASKS, TOYS - VERY DIFFICULT TO INTERRUPT

9. MUTUALITY: Measures degree of mutual and harmonious interactions and acceptance. (HARMONIOUS INTERACTION/"IN SINC")

Mutual interaction: mother actively watching, commenting on and directing child's play, child may comply or may initiate a new activity which the partner follows. Dyad is accepting of each other's actions, no discord.

Non-mutual interaction: mother or child inactively watching,no comments or interchanges. Dyad is NOT accepting of each other's actions, and may protest or ignore any attempts to change activities. Discord occurs.

1. MOST INTERACTION IS NON-MUTUAL, PDS. OF INACTIVITY

2. SOME INTERACTION IS MUTUAL, BUT AT LEAST HALF IS NON-MUTUAL

3. MOST INTERACTION IS MUTUAL, BUT SOME IS NON-MUTUAL

4. MOST INTERACTION IS MUTUAL & HARMONIOUS, A FEW PDS. OF NON-MUTUALITY.

5. ALL INTERACTION IS MUTUAL & HARMONIOUS

10. DOMINANCE: The degree to which the mother or child dominates or controls the interaction. INCLUDES SOCIAL AND OBJECT-RELATED INTERCHANGES.

1. CHILD CONTROLS STRONGLY, MOTHER IS PASSIVE

2. CHILD CONTROLS, MOTHER FOLLOWS

3. SHARED CONROL, LOTS OF TURN-TAKING

4. MOTHER CONTROLS, CHILD FOLLOWS

5. MOTHER CONTROLS STRONGLY, CHILD IS PASSIVE

The Effect of Hearing Impairment on the Quality of Attachment and Mother-Toddler Interaction

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LEDERBERG, AMY R., and MOBLEY, CARYL E. *The Effect of Hearing Impairment on the Quality of Attachment and Mother-Toddler Interaction.* CHILD DEVELOPMENT, 1990, **61**, 1596–1604. In the present study, 41 hearing impaired and 41 hearing toddlers together with their hearing mothers were observed in Ainsworth's Strange Situation and during free play. Both security of attachment and ratings of maternal and toddler behavior during free play were remarkably similar for the hearing impaired and hearing dyads. In addition, security of attachment was related to the ratings of maternal and toddler behavior in a similar way for the hearing impaired and hearing toddlers. The results suggest that development of a secure attachment and maintaining a good mother-toddler relationship does not depend on normal language development during the toddler years.

Over 90% of hearing impaired children are born to hearing parents who have had little or no previous contact with hearing impairment. In these families, both educators and researchers have hypothesized that the development of a normal mother-child relationship is disrupted by the inability of the child to understand his or her mother's normal means of communication (Harris, 1978; Moores, 1982; Schlesinger & Meadow, 1972; Wedell-Monnig & Lumley, 1980). In support of this hypothesis, hearing mothers of deaf 3–5-year-olds have been rated as more controlling, intrusive, didactic, rigid, disapproving, and negative with their children than mothers of hearing children. Deaf preschoolers have been rated as less responsive, creative, happy, and positive with their mothers than were hearing preschoolers (Schlesinger & Meadow, 1972). Other researchers have also found mothers of hearing impaired preschoolers less positive (Goss, 1970), more controlling or directive (Brinich, 1980; Henggeler & Cooper, 1983; Henggeler, Watson, & Cooper, 1984), and dominant (Nienhuys, Horsborough, & Cross, 1985) than mothers of hearing preschoolers. Meadow, Greenberg, Erting, and Carmichael (1981) found that deaf preschoolers had shorter interactions with their mothers than did hearing preschoolers. Deaf preschoolers initiated interactions less frequently than did hearing preschoolers.

Although the effect of child hearing impairment on preschoolers' mother-child relationship has been studied, little is known about younger deaf children's relationship with their mothers. There are a few small-scale studies (n = 3–6 hearing impaired subjects) that suggest that this relationship may be less problematic than that of preschoolers. Mothers of hearing impaired infants still seem to dominate interaction. They initiated more and controlled the topic of interaction more than mothers of hearing infants (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). On the other hand, mothers and their hearing impaired infants were as responsive to each other as hearing infants and their mothers (Spencer & Gutfreund, in press;

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Wedell-Monnig & Lumley, 1980). In addition, the synchrony of face-to-face interaction is within the norms for hearing infants and their mothers (Nienhuys & Tikotin, 1985).

While this research is suggestive, any conclusions based on it must be tentative. Generalizing from small sample sizes is especially problematic among the hearing impaired population, where large individual differences in social and communicative competence occur (Greenberg, 1980). In addition, these studies are limited to examining differences in the frequency of behaviors. The major difference between deaf and hearing preschool dyads seems to be in the quality of the interaction (Schlesinger & Meadow, 1972). The primary goal of the present study was to contrast the relationships between hearing impaired toddlers and their hearing mothers with those of a matched group of hearing toddlers and their mothers. Toddlers were studied rather than infants because hearing impairment is rarely identified during infancy.

The mother-toddler relationship was measured in two ways. First, the quantity and quality of mother-toddler interaction during free play was examined using coding procedures similar to the ones used with deaf preschoolers (Greenberg, 1980; Schlesinger & Meadow, 1972).

Second, the quality of the attachment relationship between mother and toddler was examined using the Strange Situation paradigm (Ainsworth, Blehar, Waters, & Wall, 1978). During the past decade, assessment of the security of the attachment bond, as described by Bowlby (1969) and Ainsworth (1973), has become a widely accepted way to describe the quality of the early mother-child relationship. Research suggests that security of attachment is related to the mother's sensitivity to the infant/toddler's needs and signals (Ainsworth et al., 1978). In addition to being an indicator of the mother-child relationship, the attachment relationship predicts social competence during the preschool years (Sroufe, 1988).

The only published study on the attachment relationship between hearing impaired children and their hearing parents used a modification of Ainsworth's procedure to examine the development of attachment among deaf preschoolers (Greenberg & Marvin, 1979). Deaf preschoolers who communicated poorly with their mothers were more delayed in the development of a mature (goal-directed partnership) attachment relationship and more likely to show behaviors indicative of an insecure attachment than deaf preschoolers who communicated well with their mothers (Greenberg & Marvin, 1979). Similarly, deaf children of *deaf* parents (and thus with high communication skills) developed attachment similar to hearing children (Meadow, Greenberg, & Erting, 1985). This research suggests that only deaf children with poor communication skills are at risk for developing insecure attachments. However, this conclusion is tentative because these studies did not include hearing children, nor did they use the traditional classification system for assessing attachment security.

Hearing impaired toddlers with hearing parents might be at risk for developing insecure attachments for several reasons. First, poor communication between hearing impaired toddlers and their mothers may lead to insecure attachments. Hearing impaired toddlers may perceive their mothers as being insensitive because their mothers respond to them with speech or vocalizations that the toddlers do not hear (Blacher & Meyer, 1983). Second, mothers of hearing impaired toddlers seem to dominate or control interaction (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). Deaf children may perceive this control as insensitivity. Finally, parents of hearing impaired children experience more stress than parents of hearing children (Friedrich, Greenberg, & Crnic, 1983), and maternal stress has been associated with attachment security (Vaughn, Egeland, Sroufe, & Waters, 1979).

On the other hand, there are some reasons to expect that hearing impaired toddlers are not at risk for developing insecure attachments. Hearing impaired infants/toddlers and their mothers seem to be as responsive to each other as hearing infants/toddlers and their mothers (Spencer & Gutfreund, in press; Wedell-Monnig & Lumley, 1980). In addition, hearing impaired toddlers may not need to hear their mothers' voice because spoken responses are frequently redundant with nonverbal visual communication. This is probably why interaction between hearing impaired infants and their mothers appears synchronous (Nienhuys & Tikotin, 1985). Finally, research with other "at risk" infants suggests that the early attachment relationship may only be affected by extreme risk factors (Easterbrooks, 1989; Goldberg, 1988; Shapiro, Sherman, Calamari, & Koch, 1987; Sierra, 1989; Stahlecker & Cohen, 1985; Wasserman, Lennon, Allen, & Shilansky, 1987).

In summary, the impact of child hearing impairment on the mother-toddler relationship was examined by assessing security of attachment and the quality and quantity of mother-toddler interaction during free play. The subjects included almost all hearing impaired toddlers enrolled in parent education programs in a major metropolitan area over a 5-year period. The results, therefore, are able to be generalized to hearing impaired toddlers enrolled in parent education programs. To ensure that results also apply to subgroups of this population, two additional analyses were conducted. One compared the mother-toddler relationship of 30 profoundly deaf toddlers with that of a matched group of hearing toddlers. The second examined the impact of age of identification and intervention on the mother-toddler relationship.

Method

Subjects

Hearing impaired toddlers and their hearing mothers (hearing impaired dyads).—The study included 41 hearing impaired toddlers who were between 18 and 25 months of age (*M* age = 22 months) and their hearing mothers.[1] All hearing impaired children and their mothers were enrolled in one of six public school parent education programs for hearing impaired children in a major metropolitan area. This represented all the urban and suburban schools in the area. Once an infant or toddler was identified as hearing impaired, he or she was referred to the public schools and enrolled in one of these six programs. Because these programs were free and consisted entirely of home visits, the participation rate was high. Parent advisors referred to us all hearing impaired children under the age of 24 months who were not multiply handicapped and whose parents were hearing. Only three mothers referred to us refused to participate. Nine toddlers, on the average, were referred during a year, with data collected over a 5-year period.

The subjects included 20 boys and 21 girls; 33 were white, 7 black, and 1 Hispanic. Thirty-seven came from intact families; there were 3 single mothers and 1 divorced mother. Nineteen mothers were employed full-time, 20 were not employed, and 2 worked part-time. One mother had a grade school education, 1 had some high school education, 10 had graduated high school, 26 had attended college, and 3 had attended graduate school. The sample clearly included a broad range of families.

On the average, the children were identified as hearing impaired at 10 months (range = 1–21 months) and had been enrolled in an intervention program for 8 months (range = 0–22 months) at the time of the study. Thirty had a severe to profound hearing loss, 7 had a moderate to severe loss, and 4 had a mild to moderate loss. Causes of hearing impairment included genes (n = 3), meningitis (n = 12), pneumonia (n = 2), atresia and birth complications (n = 1 each), and unknown (n = 22). At the time of data collection, 8 mothers were using some sign language; 11 had some training in using an oral approach; 22 mothers used only speech with their children, but had not yet decided on the type of linguistic approach they wanted to use. During the 15-min free play, the modal number of verbal utterances (either speech or sign) the children used was 0 (range = 0–69).

Hearing toddlers and their hearing mothers (hearing dyads).—The study included 41 hearing toddlers who were the same age as the hearing impaired toddlers (age range = 18–25 months; *M* age = 22 months). The hearing dyads were matched with the hearing impaired dyads on sex of child, ethnicity, family status, maternal employment, and education. The Hodge-Siegel-Rossi Index (1972) was used to assign prestige scores for maternal and paternal occupations. There were no significant differences between the two groups on maternal occupation and on paternal education and occupation. Maternal and paternal occupation ranged from blue collar to professional. The hearing toddlers were recruited through referrals from mothers of the hearing impaired toddlers (n = 6), church groups, and personal contacts. The number of utterances of the hearing children was higher than that of the hearing impaired children; on the average, they used 37 utterances during the 15 min of free play (range = 10–164).

Procedure

Each dyad was seen for two visits approximately 1 week apart. During the first visit,

[1] Eighteen months is the usual age used for assessing toddler attachment. However, we would have had a much smaller sample if we had used 18 months as our cutoff for assessments. Ten of our 41 subjects were not enrolled in an intervention program until 18 months or older. Twenty-five months was used in order to obtain the largest sample of deaf children possible and still be able to use the Strange Situation.

mothers were asked to play with their toddlers for 15 min in a playroom equipped with age-appropriate toys "as they would at home." During the second visit, the toddlers were observed in the standard Strange Situation procedure (Ainsworth et al., 1978). During both visits, interactions were videotaped using two cameras hidden behind one-way mirrors. A special effects generator was used to combine the pictures from the two cameras into a single split-screen image.

During the second visit, the Denver Developmental Screening Test (excluding the language test) was administered. None of the children were delayed in the three areas administered.

Coding Procedures

The mother-toddler relationship was assessed in three ways: quality of attachment, quantity of interaction, and quality of interaction.

Attachment.—From the videotapes of the Strange Situation, security of attachment was classified into three forced-choice groups—Avoidant (A), Secure (B), and Resistant (C)—using Ainsworth's standard classification scheme (Ainsworth et al., 1978). Researchers have recently questioned the appropriateness of this traditional scheme for assessing the attachment of handicapped children (Goldberg, Fisher-Fay, Simmons, Fowler, & Levison, 1989; Sierra, 1989; Stahlecker & Cohen, 1985). Classifying attachment of handicapped children as A, B, or C was more difficult in these studies than classifying nonhandicapped children. To see if this was also true with hearing impaired toddlers, coders were asked to categorize the tapes as difficult or not. In addition, attachment was further classified as disorganized/disordered (D) or organized (Main & Solomon, 1986). Tapes were coded by two developmental psychologists who were highly trained in scoring attachment from the Strange Situation (Margaret Owen and James Stahlecker). The latter also has extensive experience with deaf children. The two coders had established high reliability with each other on a different sample of handicapped children prior to this study. The tapes were randomly distributed between the two coders. Thirteen hearing impaired toddlers and 11 hearing toddlers were judged difficult to classify and were therefore classified independently by the other coder. This distribution of "difficult tapes" suggests that the coding of the hearing impaired and hearing toddlers' attachment was of equal difficulty. Interrater reliability on these difficult tapes was 83%. Differences were resolved by conferencing.

Quantity of interaction.—Mother-toddler interaction during free play was coded using an event sample coding procedure (Lederberg, 1984). Frequency and success rate of initiations, frequency and duration of interactions, and frequency and reason for terminations were coded. An initiation was defined as the first socially directed behavior that occurred after a 3-sec period of noninteractive activity. An initiation was successful if it received a social response within 3 sec. An interaction started with a successful initiation and continued until there was a 3-sec period without any socially directed behaviors. The person who did not respond to the last socially directed act of an interaction was coded as the terminator of that interaction. The frequency with which terminations occurred because the communication was not received by the partner (e.g., a gesture out of visual range) was also noted.

A third pair of researchers, blind to attachment classifications, coded the quantity of interaction. After all play sessions were coded, 20 randomly selected play sessions, evenly distributed between hearing impaired and hearing dyads, were recoded by the same coders. Interrater reliability, calculated using the formula agreements/disagreements + agreements, for the above described variables ranged from 79% to 95%, with a mean of 86%.[2]

Quality of interaction.—The quality of mother-toddler interaction was coded using 5-point Likert-like rating scales adapted from ones by Schlesinger and Meadow (1972) and Crawley and Spiker (1983). Two researchers independently coded all tapes for maternal behavior and the dyadic scale for communicative competence. Another two researchers independently coded all tapes for toddler behavior and two dyadic scales. All research assistants were blind to the toddlers' attachment classifications. Interrater reliability for exact agreement between members of the pairs of coders, calculated using Cohen's kappa, is noted below.

Maternal behavior was coded along the following nine dimensions: didactiveness

[2] Percentage agreement, rather than Cohen's kappa, was used because of the difficulty in unitizing to determine agreement for noncoded events in an event sample code.

(use of a formal teaching style, $\kappa = .95$), directiveness (degree of direct guidance the mother offers the child, $\kappa = .99$), stimulation value (cognitive stimulation value of maternal behavior, $\kappa = .98$), intrusiveness (amount the mother disrupts the child's behavior, $\kappa = .97$), pacing (appropriateness of the rate the mother guides activities, $\kappa = .98$), developmental approriateness of play (appropriateness of activities for the child's abilities, $\kappa = 1.00$), positive affect (amount of positive feelings expressed, $\kappa = .91$), negative affect (amount of negative feelings expressed, $\kappa = .99$), positive reinforcement (frequency and intensity of appropriate reinforcement of the child's behavior, $\kappa = .93$).

Toddler behavior was rated along the following nine dimensions: social initiative (frequency and intensity of initiations, $\kappa = .86$), social responsiveness (child compliance to maternal initiations and requests, $\kappa = .75$), affective sharing (the amount of enthusiasm and interest the child shows in interactions with mother, $\kappa = .75$), positive affect (amount of positive feelings expressed, $\kappa = .79$), negative affect (amount of negative feelings expressed, $\kappa = .93$), attention span/distractibility (degree the child is persistent in attempting to master tasks, whether successful or not, $\kappa = .61$), object initiative (amount of object-directed behavior the child engages in, independent of maternal prompting, $\kappa = .76$), pride in mastery (the expression of positive affect and pride following task accomplishment, $\kappa = .92$), and creativity (imagination and creativity of child's play, $\kappa = .84$).

In addition, the dyad was rated along three dimensions: mutuality (degree to which interactions are harmonious and in sync, $\kappa = .80$), dominance (degree to which mother or child dominates interaction, $\kappa = .77$), and communication competence (the degree that both mother and child display mutual and reciprocal understanding of each other's communicative acts, $\kappa = .97$).

Results

Quality of Attachment

A 3 (attachment security) × 2 (hearing status) chi-square analysis indicated no significant differences in the distribution of A, B, and C type attachments for the hearing impaired and hearing toddlers, $\chi^2(2, N = 82) = 3.81$, $p < .15$ (see Table 1). In fact, the number of securely and insecurely attached hearing impaired and hearing toddlers was almost identical. There were also no significant differences in the number of D classifications for the hearing impaired and hearing toddlers, $\chi^2(1, N = 82) = 3.10$, $p < .10$ ($n = 10, 4$, respectively). For further analyses, D classifications were force classified as A, B, or C type attachments (hearing impaired = 3 As, 1 B, 6 Cs; hearing = 2 A, 1 B, 1 C).

Mother-Toddler Interaction

The next series of analyses tested the effect of hearing impairment on mother-toddler interaction and explored the possibility that mother-toddler interaction is affected by an interaction between hearing status and attachment security.

Quantity of interaction.—To test for effects on the quantity of interaction, 2 (hearing impaired vs. hearing) × 2 (secure-B vs. insecure-A & C attachment) ANOVAs were conducted on the following variables: frequency and duration of interaction; frequency, average duration, and success rate of both maternal and child initiations; proportion of interactions terminated by child; and proportion of interactions terminated because the child did not receive the communication.[3]

Hearing status affected the quantity of interaction in three ways. First, hearing impaired toddlers and their mothers spent less time interacting than did hearing toddlers and their mothers, $F(1,78) = 6.55$, $p < .01$ (M = 682 sec and 764 sec, respectively). Perhaps to try to compensate for this decrease in interaction, mothers of hearing impaired toddlers initiated more to their children than did mothers of hearing toddlers, $F(1,73) = 12.24$, $p < .001$ ($M = 11.46$ and 6.82, respectively). Finally, hearing impaired toddlers were much more likely to terminate an interaction because they did not see or hear the last communication by their mothers than were hearing toddlers, $F(1,70) = 20.75$, $p < .0001$ (M = 18% and 0% of terminations by hearing impaired and hearing toddlers, respectively). There were no significant differences in any of the other measures.

None of the measures showed a significant interaction between hearing status and attachment, nor a significant effect of attachment.

[3] All variables were not calculated for all 82 dyads. For a few subjects ($n = 8$), interaction started before the camera was started and/or continued until the end of the session, resulting in no coded initiations and/or terminations. In order not to reduce all variables to an N of 74, ANOVAs rather than MANOVAs were conducted.

TABLE 1

ATTACHMENT CLASSIFICATION FOR HEARING IMPAIRED AND HEARING TODDLERS

	ATTACHMENT CLASSIFICATION		
		Insecure	
TODDLERS	Secure	Avoidant	Ambivalent/ Resistant
Hearing impaired	23	9	9
Hearing	25	13	3

Quality of interaction.—Ratings of mother-toddler interaction were analyzed using three 2 (hearing status) × 2 (attachment security) multivariate analyses of variance (MANOVAs). One MANOVA included the nine ratings of maternal behavior, one included the nine ratings of toddler behavior, and one included the three ratings of dyadic behavior. The ANOVAs were computed for individual ratings when the overall MANOVA was significant.

Hearing impairment exerted only a minimal impact on the global ratings of mother-toddler interaction, either as a main effect or in interaction with attachment security. Only the dyadic MANOVA showed a significant effect for hearing status, $F(3,76) = 3.52$, $p < .02$. Hearing impaired dyads were less communicatively competent ($M = 2.7$) than hearing dyads ($M = 3.5$), $F(1,78) = 10.55$, $p < .01$. There were no other significant multivariate or univariate differences between hearing impaired and hearing toddlers or between their mothers. Security of attachment and hearing status showed a significant interaction only for maternal behavior, $F(10,69) = 1.98$, $p < .05$, with only a significant univariate effect for negative affect, $F(1,78) = 6.20$, $p < .05$. Mothers of insecurely attached hearing toddlers expressed more negative affect than mothers of insecurely attached hearing impaired toddlers, securely attached hearing impaired toddlers, and securely attached hearing toddlers.

Security of attachment showed significant but minimal effects on maternal behavior, $F(9,70) = 2.02$, $p < .05$, and more extensive effects on toddler behavior, $F(9,70) = 2.03$, $p < .05$. Mothers of securely attached toddlers reinforced their children more than did mothers of insecurely attached toddlers, $F(1,78) = 16.56$, $p < .01$. Securely attached toddlers initiated more, $F(1,78) = 4.57$, $p < .05$, and responded more to their mothers, $F(1,78) = 4.62$, $p < .05$, showed more affective sharing, $F(1,78) = 5.32$, $p < .05$, had a longer attention span, $F(1,78) = 12.89$, $p < .001$, and were more likely to show pride after completing a task, $F(1,78) = 10.27$, $p < .001$, than insecurely attached toddlers.[4]

Analyses with Deaf Toddlers

In order to ensure that the results could be generalized to profoundly deaf toddlers, all the analyses were repeated using only data from 30 deaf toddlers and 30 matched hearing toddlers. There were no differences between these results and those reported previously. Security of attachment did not differ between the profoundly deaf and hearing dyads, $\chi^2(1, N = 60) = .28$, $p < .59$ (n secure = 17, 19, respectively), nor did the number of disorganized attachments differ significantly (n = 4, 2, respectively). As with the whole sample, the only effect of deafness on quality of interaction was to decrease dyadic communicative competence. Finally, deaf dyads interacted for less time, had more maternal initiations, and had more terminations due to miscommunication than hearing dyads.

Ages of Identification and Intervention

To determine whether differences in attachment were related to either the age that children were identified as hearing impaired or the number of months enrolled in intervention, t tests (secure vs. insecure attachment) were conducted using these two variables as dependent variables. In addition, age of identification and months in intervention were correlated with all interaction measures. Ages of identification and intervention were not

[4] An additional series of analyses was conducted. To test for sex differences, all analyses were repeated with sex as an additional factor. No main or interaction effects were found.

significantly related to attachment or any measure of mother-toddler interaction.

Discussion

As expected, hearing impairment affected the ability of mother and toddler to communicate effectively. Hearing impaired toddlers and their mothers were judged to miscommunicate much more frequently than hearing toddlers and their mothers. Consistent with this global rating, hearing impaired toddlers frequently did not respond to their mothers' communication because they did not seem to hear or see it. These problems probably result from the need to communicate visually. Unlike hearing children who can listen to speech while visually attending to objects, deaf children have to divide their visual attention between the environment and the communicator in order to receive the communication. Learning to coordinate their visual attention appropriately is one of the major learning tasks that hearing impaired children have to accomplish, and it may not be completed until well into the preschool years (Wood, Wood, Griffiths, & Howarth, 1986). In addition, hearing parents have to learn to coordinate their communication with their child's attention (Spencer & Gutfreund, in press). The hearing impaired toddlers and their mothers spent less time interacting than hearing toddlers and their mothers. This may also have been caused by the hearing impaired toddlers' difficulty attending to their mother while playing with the toys in the room. Finally, similar to past research (Wedell-Monnig & Lumley, 1980), mothers of hearing impaired toddlers initiated interactions more than mothers of hearing toddlers. Others have interpreted this increase in maternal initiation as an increase in maternal directiveness or dominance (e.g., Jones, 1980; Wedell-Monnig & Lumley, 1980). However, in the present study, mothers of hearing impaired and hearing toddlers did not differ on qualitative ratings of dominance or directiveness. Thus, although mothers of hearing impaired toddlers may have been more responsible for starting an interaction, these mothers were as likely as mothers of hearing children to allow their child to set the topic and to control the interaction. Given that an initiation is defined as the first social behavior following noninteraction, mothers of hearing impaired toddlers may just have had more opportunity to initiate interactions because the dyads spent less time interacting.

Despite these effects on communication and quantity of interaction, hearing impairment did not affect the quality of the relationship between mother and toddler. Ratings of the quality of maternal and toddler behavior during free play were similar for the hearing impaired and hearing dyads. Thus, the two groups of mothers did not differ on affect, sensitivity, control, or teaching behavior. The hearing impaired and hearing toddlers did not differ on initiative, compliance, affect, attention span, pride in mastery, or creativity. Consistent with the lack of differences in quality of interaction, there were no differences in the hearing impaired and hearing toddlers' security of attachment to mother.

Unlike other handicapped populations, hearing impaired children were not more difficult to classify and did not show significantly more disorganized attachments than hearing toddlers. In addition, mother-toddler interaction and security of attachment were related in similar ways for both hearing impaired and hearing toddlers. Securely attached toddlers were happier and more socially interactive and compliant, and had longer attention spans and showed more pride in mastery than insecurely attached toddlers. Mothers of secure toddlers reinforced them more than mothers of insecure toddlers. The fact that relations between attachment and maternal-toddler behavior were the same for both hearing impaired and hearing toddlers and are consistent with attachment theory suggests that both the Strange Situation and the standard coding procedure were a valid assessment of the hearing impaired toddlers' quality of attachment.

Thus, despite their communicative difficulties and their delayed language development, hearing impaired toddlers were as likely to establish a positive, reciprocal, secure relationship with their mothers as were hearing toddlers. This was true for the subsample of profoundly deaf toddlers as well as for the whole sample. The results, together with past research, suggest that "sensitive" caregivers can adapt to a variety of special needs of their infants/toddlers in such a way as to make their children feel secure in their care. Caregivers seem to be able to adapt to the needs of children who are hearing impaired, premature, neurologically impaired, physically impaired, or have difficult temperaments (Goldberg, 1988; Stahlecker & Cohen, 1985; Vaughn, Lefever, Seifer, & Barglow, 1989; Wasserman et al., 1987). As Goldberg (1988) points out, this supports Ainsworth's hypothesis that the quality of the early attachment relationship is more dependent on ma-

ternal than infant characteristics (Ainsworth et al., 1978).

With hearing impaired children, maternal adaptation probably entails using enough visual and physical communication that hearing impaired toddlers feel that their needs are being met. Thus, for example, the hearing impaired toddler would not need to hear their mother's comforting voice because their mother is also communicating that comfort visually and physically through body language. It is likely, even before the mother knows her child is hearing impaired, that the infant shapes appropriate responses from her by not being comforted by responses that are solely auditory. These adaptations did not seem to be due to educational intervention since the number of months the dyads were enrolled in intervention programs did not relate to any measure of interaction.

The findings in the present study, together with past research with preschool children (Meadow et al., 1981; Schlesinger & Meadow, 1972), suggest that the impact of hearing impairment on mother-child interaction increases from toddlerhood to preschool. This change may be due to a developmental change in the importance of language for normal mother-child interaction. The poor quality of interaction between deaf preschoolers and their mothers seems to be due to communication problems (Greenberg, 1980; Schlesinger & Meadow, 1972). In contrast, in the present study, although hearing impairment affected communication, this effect did not, in turn, affect the mother-toddler social relationship in a major way. The inability to communicate effectively and to use language may become more disruptive to the mother-child relationship as the children get older because age-appropriate activities become more dependent on language and good communication.

On the other hand, differences between our results and those with preschoolers may be caused by differences in the characteristics of the hearing impaired children studied. In the present study, by necessity, only hearing impaired toddlers already identified as such and enrolled in an intervention program were studied. There may be more insecure attachments and worse social interaction patterns between hearing impaired toddlers and parents who are not sensitive enough to notice or to seek help for a hearing problem until that child is older. Unlike the present study, the studies with preschool children included children who were identified after 2 years of age. Thus, the apparent deterioration of the mother-child relationship may just be caused by inclusion of these late identified children in the preschool studies. In support of this explanation, in the research by Greenberg and colleagues (Greenberg, 1980; Greenberg & Marvin, 1979; Meadow et al., 1981), the average age of identification of the high communicatively competent children was 13 months (similar to the present study), while the average age of identification for the low communicatively competent children was 21 months. It was the latter children that seemed to account for most of the effects of hearing impairment. This possibility highlights the importance of longitudinal research for understanding developmental changes in the impact of hearing impairment on the mother-child relationship. We are at present collecting such data.

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